WORLD OIL

Established 1916 as THE OIL WEEKLY

Specialized Oil Publications of
THE GULF PUBLISHING COMPANY
Box 2608, Houston (1), Texas

WORLD OIL and The COMPOSITE CATALOG
for the drilling-producing-pipe line industry

PETROLEUM REFINER and The REFINERY CATALOG
for the refining-natural gasoline industry

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Published every Monday. Single copies 25 cents (except special issues). Subscription price: domestic and foreign, $2 a year; 2 years, $3; 3 years, $4. Advertising rates on application.

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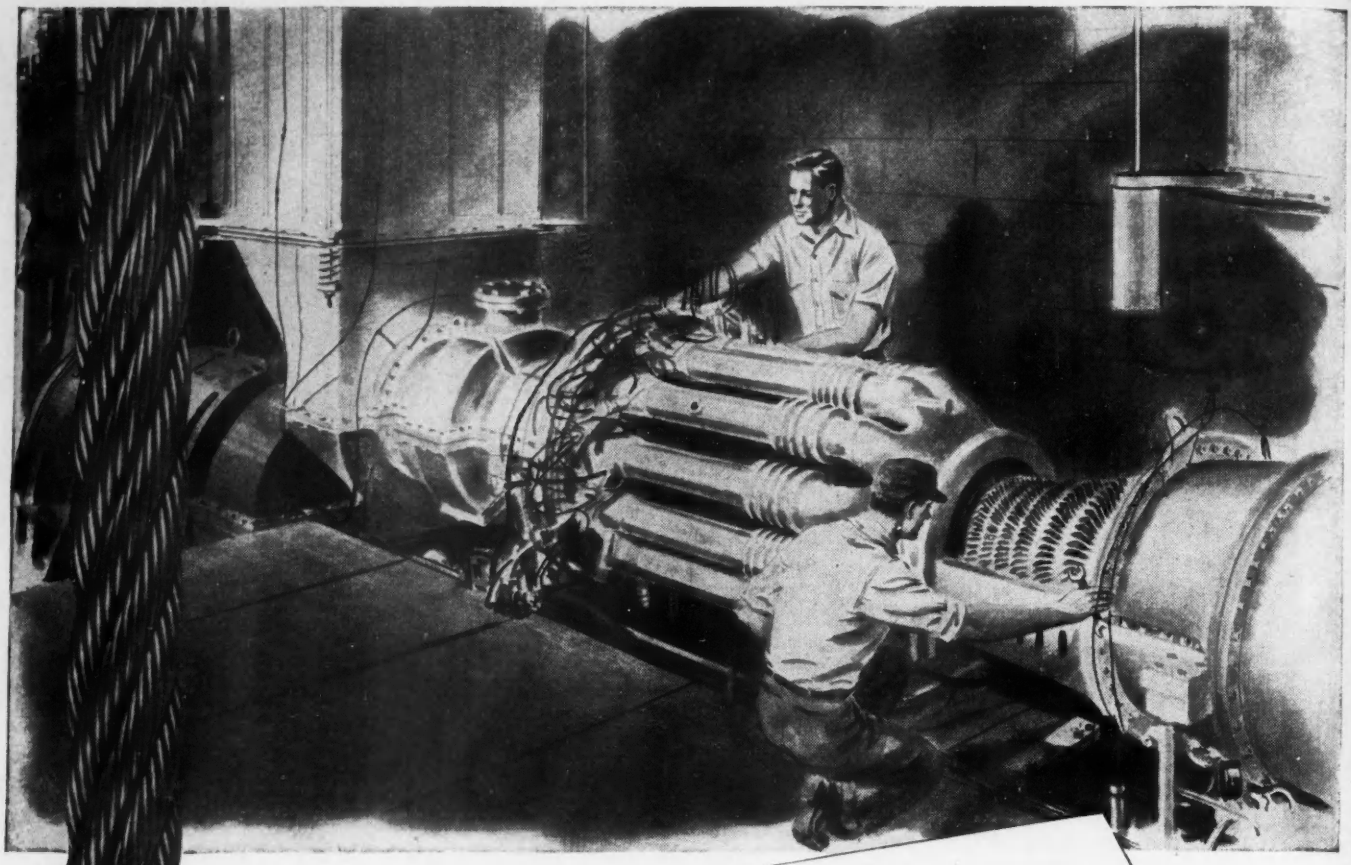

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THE OUTLOOK

INDUSTRY expects that some means will be worked out of keeping export trade at a high level despite the world dollar-shortage, since Administration officials are aware that 5 percent of our non-agricultural workers are directly or indirectly producing goods and services for export and the failure of the foreign market might result in several million persons being thrown out of work.

BARRING A DOWNWARD price swing, of which there now is no indication, pressure for the reimposition of wartime price controls will be heavy when Congress reconvenes. The Army reportedly is also preparing to head a movement for the reimposition of food rationing, believing that in no other way will it be possible to get the supplies needed for foreign relief.

EXPORT of 40,000 tons of pipe for the Saudi Arabian pipe line is expected to be approved, largely at the insistence of the military that the resulting supply of oil will be important to the national defense, either as direct supply or to replace oil procured in this country should the domestic production prove inadequate to meet all demands.

AN ADAPTATION of the Cartesian diver principle for determination of batch change in pipe line pumping may enable the "slop tank" percentage of a run to be cut by more than half, if present experiments prove successful.

THE FEDERAL POWER COMMISSION will O.K. use of the Big Inch lines for natural gas early next month, paving the way for final consummation of purchase of the properties from the government by Tennessee Eastern Transmission Corporation.

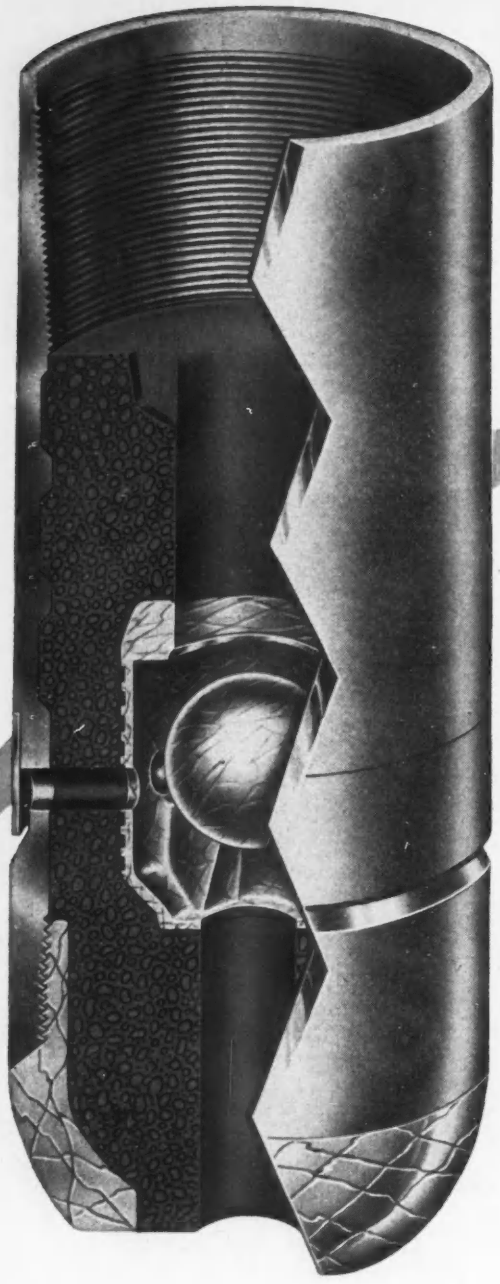
THE MARSHALL PLAN will call for the export of large quantities of steel to help rehabilitate industries abroad, throwing another impediment in the way of oil and natural gas companies seeking to narrow the ever-spreading gap between available facilities and growing demand.

THERE IS little chance of Poland looking to the U. S. for either oil products or oil-industry equipment in the foreseeable future. Official Polish figures show that currently synthetic gasoline and rubber are being secured from the Russian zone of Germany, which apparently has not outlawed those industries as have the U. S. and England in their zones, and oil products from Hungary and Roumania. The only oil from outside the Red belt was imported from Great Britain.

A NEW electrically driven centrifugal pump, so designed that it may be cut into a line and assembled there simply by placing and connecting two flange unions, may offer a solution to the problem of cooling field gathering-pump motors. The design is such that the fluid flows through the integral rotor and motor.

COURT ACTION against oil companies conducting seismograph operations in the Gulf of Mexico is likely. Climaxing widespread complaints among sport and commercial fishermen and charges in Gulf Coast newspapers that explosions are destroying much marine life, the acting county attorney of Galveston County, Texas, last week promised a protest meeting that "I will attempt to prosecute any offenders to the full extent of the law."

A METHOD of electroplating which may be useful in combatting corrosion of gas-distillate well fittings, features the periodic reversal of the plating current. The metal film thus deposited is said to be much more dense than one obtained with normal (unidirectional current) plating, and also so smooth as to require no polishing.



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THE CHANGING Panorama

High Prices, High Taxes Go Together

WHILE we are considering the causes of high prices, it is well not to forget the part which high taxes play in the picture.

We heard a lot beginning more than a year ago about "take-home pay." People whose income, even in part, comes from the profits of business, also are faced with the "take-home" problem, but in addition to that problem they have seen local, state and federal governments (particularly the federal government) constantly taking a bigger and bigger slice of the profits of business enterprise. Even with the wartime excess profits eliminated, the tax portion of the cost of producing, and the income tax portion of profits add up to a higher price to get a life-sustaining profit.

Our federal government, whether wisely or not, continues to expend billions on non-productive enterprises outside the U. S. And there seems to be no end to the money-spending possibilities thus involved.

In our humble opinion, if taxes were less, the price of necessary products would be lower; the relationship between the two cannot be denied. Thus if Mr. Truman is intelligently interested in lower prices to the ordinary citizen it would seem that he would be equally interested in cutting down the cost of government and the reduction of taxes.

Calling Mr. Clark

SOME labor unions, in open defiance of the Taft-Hartley law, have published newspaper advertisements entering actively into politics. It will be interesting to see what Attorney General Clark's department will do. If the matter is properly called to his attention and he fails to follow his oath of office, we suspect somebody's tail will be in a crack.

Radioactivity Surveys And Atomic Bombs

THE measurement of radon emanations, as a survey method for delimiting producing areas, has come to be regarded as a useful adiunct to field development. Perhaps the verb should read **"had."** Areas which had been thoroughly canvassed by the determination of the minute changes in radioactivity before the date of the first — Alamogordo — atomic bomb, and for which definite maps had been established now show a pattern of activity wholly at variance with that initially determined. And, in every instance, the change is additive; that is, areas formerly designated in the field man's lingo as "hot," now are larger, or are supplemented by other adjacent sections which now show high radioactivity. Other areas, previously traversed and showing nothing of interest in the matter of radon emanations, now check high—and fail to bear out the showings when drill-tested.

Has one of the geologist's promising aids been vitiated by the atomic bomb? And, if so, have the changes initiated by the explosion—not only that of Alamogordo, but also those of Japan and the later Navy tests—reached their peak in intensity and distribution? If not, how differentiate between atomic bomb "dustings" of an area and the emanations from petroliferous conditions underground? The eclipse of radon emanation oil determination is—temporarily, at least —on the list of atomic bomb victims; it must be supplemented by other tests, or replaced by a new technique, if it is to continue to prove as valuable as it was before Bomb 1 Day.

There'll Be Fuel In the Year 2000

IN A recent speech before a convention of electric power company officials, the statement was made that 50 years from now coal alone would be available in sufficient quantities to meet the world's power requirements.

Fifty years is a long time to look ahead on any scientific subject in these days of accelerated research; it is especially hazardous to make predictions with regard to the dominant fuel source at that distant date. For the past quarter of a century petroleum interests have been countering such statements as "oil will be exhausted in the next ten years," with "oil will be plentiful for many years to come."

Both fuels are still being produced in ever increasing quantities annually, though the relative percentages of each may vary due to conditions outside either industry's control.

Oil-bearing shales, lignite, vast peat beds such as underlie parts of Alaska and Siberia; any of these may take the baton from exhausted coal or crude.

At the rate scientific research has progressed during the past decade, it is reasonable to conclude that development will be not only along the lines of better use of present known sources of power, but also that the next quarter-century may see the general, commercial development of atomic power, or that within that time some completely new source of energy may be developed. Atomic power, for instance, was only a technician's dream a score of years ago, but saw rapid development under World War II's urge.

Liquefied coal, liquefied natural gas, "in place" gasification of coal underground, atomic piles, solar-ray absorption plants, subterranean heat taps, any or all of these may be serving the peoples of the year 2000—assuming that the present cycle of *Homo Sapiens* has not been self-erased before that date.

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THE WEEK'S NEWS

Court Asked to Protect U. S. Tidelands Interests Pending Action by Congress

The Supreme Court last week was asked by the Department of Justice to render a decree in the California tidelands case which would adequately protect the interests of the U. S. pending legislation on the matter by Congress.

The three-paragraph proposal was submitted by Attorney General Tom C. Clark in response to the court's announcement, in its opinion of June 23, last, that either of the parties . . . the government or the state . . . might submit recommendations as to its formal decree up to September 15.

The first paragraph of Clark's proposal formalized the court's findings that the California offshore oil lands between ordinary low-water mark and the three-mile limit, belonged to the federal government. The second paragraph held that the U. S. is entitled to the injunctive relief prayed for in the complaint, and the third reserved jurisdiction to the court to enter such further orders and issue such writs as may from time to time be deemed advisable or necessary to give full force and effect to the decree.

In a brief memorandum in support of the proposed decree, Clark said no injunctive relief is being sought at this time because (1) the parties to the litigation have entered into a stipulation that until pertinent legislation is enacted by Congress but not later than September 30, 1948, all operations in the affected area carried on under leases issued by the state may continue without interruption; and (2) it is apparent from that stipulation that the parties expect legislative action pertinent to the subject-matter of the litigation.

"This court has, in the past, deemed it appropriate that injunctive relief be attuned to anticipated Congressional action," Clark pointed out. "In the present situation, we think it proper that injunctive relief be withheld until Congress has had a reasonable opportunity to enact legislation providing for the management, administration and control of those areas which this court has ruled to be subject to the paramount rights of the U. S. It should be made clear, however, as we think the proposed decree does , that the U. S. is entitled to injunctive relief to be available to it as circumstances require, perhaps even before Congressional action."

The proposed decree, Clark explained, is general in terms because the study of the physical characteristics of the area in question, which is a necessary preliminary to the drawing of a line of demarcation between the marginal belt and the tidelands and inland waters, has not been completed.

"When this study is concluded," he said, "it is expected that a further, more detailed, decree will be sought. The application for such a decree, as well as circumstances which may arise in the future, undoubtedly will require further action by this court, and for that reason, it is proposed that jurisdiction be reserved."

Standard of Texas' Plea for Change in Yates Rules Denied

The two-year old application of Standard Oil Company of Texas for amendment of the rules governing the giant Yates field of Pecos County was denied last week by the Texas Railroad Commission. Commission Chairman Ernest O. Thompson signed the order denying the request of October 23, 1945, without qualification.

Commissioner Olin Culberson affixed his signature to the following proviso: "I concur in the order denying the application of Standard Oil Company of Texas insofar as said application seeks to set up an allocation formula based on 100 percent of reserves and oil in place. I dissent from the order denying said application insofar as I believe the allocation formula should be amended and 100 percent average unit potential should be set aside and in lieu thereof, I am willing to go as high in allowing an allocation formula to be based on 100 percent potential as long as it does away with the average unit potential."

Commissioner William J. Murray, Jr., stated that he could not participate in the decision because of prior employment by the applicant before he took office on January 1, 1947.

Rise in Prices Threatens Weaker Spots in Economy

The government last week ran up storm-warning flags as the rising tide of prices threatened the weaker spots in the national economy.

A survey by the Census Bureau showed that consumers are being forced to forego luxuries in order to buy the necessities of life.

While oil product prices have shown a tendency to stabilize, with actual reductions in quotations on gasoline and fuel oil on the East Coast, the prices of other products have continued their upward trend, and Census Bureau figures indicate that the increase in income has not kept pace.

The bureau found that the July dollar volume of wholesale sales of jewelry was 30 percent below the same month last year, that of liquor 32 percent lower, while the dollar volume of grocery sales was up 18 percent, clothing 10 percent, furniture 9 percent and drugs 8 percent. It all boiled down to the fact that so much of the consumer's dollar is required to keep alive that little is left for luxuries.

The major question posed by the census figures is how long the luxury trades can operate on reduced volume without laying off workers and whether their surplus labor could be absorbed into other industries.

Texas Allowable for October Fixed at 2,555,224 Barrels

The Texas Railroad Commission has issued its October proration order fixing a net allowable of 2,555,224 barrels daily. This is 9477 barrels less than that allowed as of September 13.

The Gulf Coast was cut 7959 barrels daily, East Central Texas 2301 barrels, and West Texas 10,106 barrels. Southwest Texas was increased 4481 barrels, East Texas 4265, and North Texas 2898 barrels.

The state as a whole is exempt from shutdowns—may produce the entire 31-day period. East Texas was increased from 21 to 22 producing days.

The commission estimates that operators will produce 7 percent less oil than is allowed, which will mean actual production of 2,376,358 barrels. To this will be added 197,958 barrels of distillate and natural gasoline, bringing the state total to 2,574,316 barrels of all oils. The Bureau of Mines forecast of demand for Texas crude during October is 2,300,000 barrels.

Purchaser nominations totaled 2,740,971 barrels, an increase of 92,071 over September. Broken down, the increases amounted to 10,285 barrels for Southwest Texas, 37,443 for the Gulf Coast, 2180 for East Texas (outside), 4138 for West Central Texas, 36,352 for West Texas, and 1078 for North Texas. Texas current production is around 2,333,000 barrels of crude plus about 200,000 barrels of distillate and natural gasoline.

In the Gulf Coast, Phillips Petroleum Company announced it has begun operation of the 25,000-barrel Sweeney plant of Alamo Refining Company in Brazoria County. T. L. Dyer said that 5500 barrels of crude is currently being obtained from the Old Ocean field, leaving a 19,500 barrel shortage.

Also at the statewide hearing, Eastern States Petroleum Company, now short 8500 barrels, said that it will be short 15,000 barrels daily on October 1. Republic Oil and Refining Company announced it will be in the red approximately 100,000 barrels per month for the next 90 days but that its backlog might see it through October.

H. P. Nichols of the East Texas Oil Association asked that producing days in East Texas be cut from 21 to 20 during October—pointed out that the bottom-hole pressure declined 8.92 pounds during July and August. Paul McDermott of Sinclair Refining Company contended that the two-pound arrest in the rate of decline during August justified continuation on the 21-day basis.

WAA Sells Plant

War Assets Administration has sold an Odessa, Texas, channel carbon black plant operated during the war by the United Carbon Company to Sid W. Richardson, Fort Worth independent oil and gas operator, for $4,300,000. The plant was one of the largest built by the government. It consists of 670 buildings on 426 acres of land, and has a capacity of 45 million pounds of carbon black annually.

CNGA's First President Welcomed

The California Natural Gasoline Association's first president, Paul D. Barton, was welcomed to the association's 264th meeting by F. J. Colton, CNGA's 22nd president. Barton, now Sun Oil Company's chief engineer, was with Richfield Oil Corporation at the time of CNGA's founding. Those in the picture, left to right are M. W. Kibre, W. A. Kirk, Paul D. Barton, H. L. Eggleston, F. J. Colton, M. L. Arnold, J. A. Campbell and H. R. Linhoff. All are past presidents of CNGA except F. J. Colton, current president; W. A. Kirk, current vice president; and J. A. Campbell, vice president during the 1926 term.

Organization of Company to Operate Middle East Line Nears Completion

Final formation of Middle East Pipe Lines, Ltd., is expected to be announced shortly, following current discussions being held in London between British and American interests. The company will be organized for the purpose of constructing and operating a 30-inch line from the Anglo-Iranian company's fields in Iran to the Eastern Mediterranean coast.

M.E.P.L. as constituted will be composed of a 40 percent interest by Standard Oil Company (N. J.), 10 percent interest by Socony-Vacuum Oil Company, and a 50 percent interest by Anglo-Iranian Oil Company. Charles Lockett of Jersey Standard is now representing the American interests at the London conferences, while J. E. Anderson, of Anglo-Iranian, has been loaned to the Jersey company temporarily.

Anderson says that while organization of the company will be speeded, no operating plans for the line itself will be drawn until after Trans-Arabian Pipe Line Company (subsidiary of Arabian American) irons out its negotiations with the Syrian government. TAP line recently reached an accord with Syria but that agreement must still be ratified by the Syrian Parliament.

About two years ago Jersey Standard acquired a ground lease on land just out of Tripoli, Lebanon, for the declared purpose of building a refinery there. It is considered possible that the M.E.L.P. line may run to Tripoli, which also is one of the terminals of the Iraq Petroleum Company line from Kirkuk.

Industry Officials in Parley On Emergency Transportation

Representatives of industry and transporation met last week with government officials to discuss means of developing a better integration of commercial and military transportation as a step toward preparedness in the event of another national emergency.

Outlining the military's plans for developing a comprehensive transportation net which would be adequate under even greater demands than developed during the last war, Major General Edmond H. Leavey, Army chief of transportation, told the meeting that the need of close coordination with industry, educational center, professional associations and other governmental agencies for the purpose of organizing the national defense "cannot be overemphasized."

Among those attending the conference were Gavin W. Laurie of The Atlantic Refining Company, Philadelphia, and J. F. Winchester of Standard Oil Company (N. J.) New York.

Federal Bureau Drops F.O.B. Rule from Bids for Supplies

In quick response to a complaint of the National Tank Truck Carriers, Inc., that present procedures for the purchase of oil contracts work to the disadvantage of the small supplier without transportation facilities of his own, the Bureau of Federal Supply has announced it will eliminate from future bid forms a condition that all quotations on gasoline and fuel oil be f.o.b. destination.

In a letter to the association, W. E. Gannon, purchasing agent for the bureau, while not agreeing to the contention that the condition restrained competition between common and private carriers, said there was no objection to its discontinuance. However, he said, where it appears to be to the advantage of the government to accept a f.o.b. destination quotation against a f.o.b. bulk plant quotation, award will be made on the former which, he added, carries "obvious" advantages, "unless the price differential nullifies them."

Underground Gasification of Coal Experiment Is Success

Gases ranging from 47 to 200 British thermal units per cubic foot and averaging 108 cubic feet per pound of coal consumed, with both figures probably subject to considerable improvement, were produced last winter in a seven-week experiment in underground coal gasification conducted by the Bureau of Mines and the Alabama Power Company at Gorgas, Ala., according to the detailed report just made available by the bureau.

Using various methods of operation, the bureau determined that gases could be generated specifically for use for generating power or suitable for synthesis purposes. During the course of the experiment, it is estimated that 236 tons of coal were burned completely and 164 tons were coked.

The Gorgas operation was the first extensive experiment in this country to determine the feasibility of producing gas from coal underground, a process which has been in practical use in Russia for many years, but regarding which little technical information has been published.

While no consideration was given commercial cost factors, the experiment determined that coal in place could be burned successfully, that the burning could be controlled, that the action of the roof appeared favorable for underground gasification because no interfering roof falls occurred, and that the quantity and heating value of the gas produced per pound of coal burned varied with the method followed.

Report Says Highway Taxes Used for Other Purposes

Public Roads Administration issued a report of the uses for various state highway taxes in 1946, showing that $94,578,000 or 5.8 percent of the total revenue of $1,615,999,000 was spent on non-highway purposes. Motor fuel tax receipts, the bulk of states' highway user revenues, totaled $1,064,681,000 in 1946, motor vehicle receipts $520,780,000, and motor carrier receipts $30,538,000.

Houston API Meeting

The Houston Chapter, API, has scheduled its first fall meeting for September 23, 1947. C. W. Alcorn, vice president and general manager, Falcon-Seaboard Drilling Company, will speak on "General Aspects of Drilling" at the dinner meeting in the YMCA Building.

Oil Industry Came Through Summer Season in Good Style, Says Thompson

Ernest O. Thompson, Texas Railroad Commission chairman, thinks the oil industry came through the heavy consuming summer season in good style, he stated last week.

"While there were spot shortages in gasoline in a few instances due to shortage of transportation facilities, both pipe line and tank car, on the whole, an admirable job was done by the oil industry," said Thompson. "The oil was produced in quantities sufficient to enable the refineries to turn out the required amounts of gasoline and we have come to the close of the heavy gasoline consuming season with crude stocks as of September 6 standing at 226,154,000 barrels and gasoline stocks as of the same date in the amount of 83,336,000 barrels."

Further, says the Commissioner, "gas oil and distillate stocks stand at 56,763,000 barrels as compared with 55,626,000 barrels on September 7 a year ago. Residual fuel oil stocks September 6 this year were 56,168,000 barrels as compared with 54,936,000 barrels a year ago that date.

"Crude production is soaring constantly to new levels. Crude stocks gained 639,000 barrels during the latest week reported and crude stocks stand at 1,149,000 barrels more than was on hand a year ago.

"Gasoline production for the same week was 16,205,000 barrels, which was 799,000 barrels more than was produced in the same week a year ago."

Figures Indicate Export Curb Will Not Give U. S. More Steel

Considerable doubt that the recently imposed controls on the export of steel products actually will increase the domestic supply of oilfield equipment is indicated by government figures showing that 13 percent of the workers in the metal industries are directly or indirectly producing for export. In 1939, only 10 percent of a much smaller working force was so engaged.

Bureau of Labor Statistics figures show that approximately 800,000 workers in the metals industries are producing for foreign consumption, as against 300,000 in 1939. Not all of these workers are in the steel industry, of course, but since steel is the dominant metal it undoubtedly accounts for the most substantial proportion.

"Exports are not drawing heavily upon our total manpower resources, but they nevertheless are extremely important to employment in some fields," Commissioner of Labor Statistics Ewan Clague commented in discussing the figures.

Aside from the metals, textile and apparel fields, in most other industries, notably petroleum chemicals and coal, the relative importance of foreign trade has not changed significally since 1939, the figures indicated.

Commenting on the industry's expansion program. Thompson said: "The oil industry is planning to expand by spending $3 billion in the U. S. during the next three or four years. This planned expansion includes new pipe line facilities, new refining facilities, and additional marketing facilities. This program of expansion should bring the industry up to the point where it will be able to take care of the unprecedented and wholly unexpected increase in demand for oil products.

"It should be remembered that during the war years the oil industry was not permitted to expand its facilities for ordinary peacetime requirements, and the industry is to be congratulated upon being able to take care of this high demand with the old prewar plants."

R. P. Swinsky, Gulf Publishing Company Director, Succumbs

R. P. (Dick) Swinsky, 48, a director of The Gulf Publishing Company, and for more than 22 years manager of the company's New York office, died of a cerebral hemorrhage at Houston September 13.

R. P. Swinsky

He resigned as vice president of the company July 1 to form his own publishing business, which was still in the organization stage at the time of his death. Before he joined Gulf Publishing and took charge of advertising in New York, he had worked for Houston's three daily newspapers. A native of Dallas, and brother of the late Albert Swinsky, advertising director of the Dallas *Times-Herald*, he was a substantial stockholder in the Times-Herald Publishing Company. As a vice-president of The Gulf Publishing Company, he was considered an authority on the marketing of oil field equipment and supplies.

He was a member of the Nomads and the Dotted Line Club of New York.

Report of Discovery in Japan Is Heard With Skepticism

Newspaper reports of the discovery of the "biggest oil field in Japan" were read with skepticism last week by men in the industry and U. S. government officials.

The story quoted Japanese newspapers on a strike near Teshio on the west coast of Hokkaido near the northern tip of the island.

An official of the State Department declared he had no official news of the discovery. A spokesman for a major company expressed doubt that a well was drilling in the area.

Texas Operators Seek Facts On Extension of Leases

Operators who attended the Texas School Land Board's hearing last week relative to the extension of leases on state lands beyond the 25-year limitation period generally came to seek rather than offer information. A law passed by the 50th Legislature gives the operators until October 1, 1948, to renew their leases for a period extending so long as production is had.

At the outset Land Commissioner Bascom Giles announced that the board's purpose was to set up a formula for arriving at an equitable price for extending the leases beyond the 25-year period. Dr. Harold Vance of Texas A. & M. College thought this problem entails consideration of a number of factors, including an estimate of recoverable oil in place at the end of the primary term, production costs, a reasonable discount factor for cash bonsuses, what price basis should be applied, and whether a hazard factor would be permitted.

Dr. George Fancher of The University of Texas said that in his opinion payments in terms of extra royalty would be of considerable advantage to the state. Paul McDermott of Sinclair Refining Company thought that at least in instances of very limited remaining reserves, it would be to the best interest of the state to decrease its consideration as an incentive to operators to produce the property to a lower limit.

A. W. Bounds of Stanolind Oil & Gas Company did not think any blanket formula could be adopted. He suggested that because operators probably would insist on a 50 percent hazard factor, the state would be improvident if it does not accept an override and run its risk along with the operators.

Dan J. White, Jr., Salt Dome Oil Corporation representative, advanced the following formula: Determine the reserves remaining at the end of the 25-year lease period, determine the value of the reserves using a 50 percent hazard factor, determine the worth by using an acceptable discount value factor, then pay the state ⅛ of this worth.

Ed J. Hamner, assistant chief geologist for Humble Oil Refining Company, advocated an additional 15 percent bonus for non-producing acreage—recommended no more than the $2 minimum for leases which would be marginal at the end of the 25 years and that the operator be given an override in such instance. He thought it feasible to attempt to figure the value to be paid for leases under which substantial reserves will remain at the end of the primary term. Even the operators of these, he said, probably should be permitted a sliding scale override.

Gilbert M. Denman, State Board of Education representative, expressed the opinion that cash rather than oil will bring in less money to the state.

Giles announced that the board has decided on a fee to be charged as filing expense in connection with the extension program—25 cents per acre on non-producing leases and 50 cents per acre on producing leases.

Contracts Awarded for Construction Of Facilities on Cities Service Lines

Contracts have been awarded for construction activities that are part of a $36 million pipe line project, according to S. B. Irelan, president of Cities Service Gas Company.

First phase of the project is the building of a modern residential community consisting of 51 homes for station workers, a community house, and office buildings. The residences will be single-story two- and three-bedroom types of prefabricated design with individual garage, full basement, and gas, electric and water facilities. The complete project will cost more than $500,000. The contract was awarded to Whitmor Home Builders of Tulsa.

On the same site, a half-section in Grant County, near Ulysses, Kansas, in the Kansas-Hugoton field, Sherwood Construction Company will construct the concrete foundation structures for the main compressor engine building, an auxiliary building for power generation, a machine shop and other equipment, and a gas-dehydration tower. Total cost of all facilities at the new compressor station community alone will be in excess of $5 million.

Plans call for the installation of 17,600 horsepower from 11 compressor engine units of 1600-horsepower each, and a delivery capacity of 240 million cubic feet of gas daily by the end of 1948. Compressor station capacity will be increased to 46,400 total installed horsepower from 29 engine units between 1948 and 1950.

All these facilities are part of the increase of the system's capacity to 370 million cubic feet of gas daily through a 400-mile, 26-inch line from the Kansas-Hugoton field across Kansas. In 1948 Cities Service anticipates being able to lay 200 miles of the line from Ulysses to Hutchinson and perhaps a 45-mile section from Ottawa to Kansas City.

Two Pipe Line Executives Are Appointed by Sohio Company

James R. Shipley, Jr., was named chief engineer, and Joseph D. Harnett, general superintendent, of The Sohio Pipe Line Company and of the Transportation Department of The Sohio Petroleum Company, two subsidiaries of The Standard Oil Company (Ohio), it was announced by S. H. Elliott, Transportation vice president of The Standard Oil Company (Ohio).

Both will assist E. F. Morrill, vice president of Sohio Pipe Line Company, who functions also as assistant manager of the Transportation Department of The Standard Oil Company (Ohio) and manager of the Transportation Department of Sohio Petroleum Company.

At the same time, Charles B. Lester was named head of the new Research and Development Section formed to assist Shipley.

Offices of all three men will continue to be in St. Louis.

All pipe line operations of The Standard Oil Company (Ohio) and of its subsidiaries, involving more than 3100 miles of pipe line, will be under the direction of Harnett.

135-Mile, 14-Inch Mexico Gas Line Now in Operation

Gas Industrial de Monterrey, S.A.'s Texas-Mexico natural gas line has been completed and the city and industries of Monterrey are now receiving gas taken from the Reynosa Pipe Line Company's 17-mile, 12-inch line in Texas, also recently completed.

The Mexico line, 135 miles of 14-inch line, was constructed by Contratistas Del Norte, S.S., subsidiary of O. C. Whitaker Company. There are no compressors on the line, because the gas from Texas wells has a high rock pressure. Ultimate capacity of the system will be 50 million cubic feet per day.

Crude Oil Production in the United States

(Estimates compiled by WORLD OIL. All figures indicate daily averages in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED Sept. 20	Sept. 13
Alabama	1,100	1,100
Arkansas	76,300	76,000
California	921,400	925,000
Colorado	49,000	48,000
Florida	1,025	1,025
Illinois	171,200	175,800
Indiana	17,700	17,000
Kansas	298,050	298,900
Kentucky	25,300	25,000
Louisiana	433,400	432,600
North Louisiana	100,800	100,000
South Louisiana	332,600	332,600
Michigan	45,000	43,500
Mississippi	101,800	104,800
Missouri	100	100
Montana	24,600	24,000
Nebraska	550	600
New Mexico	117,800	117,800
New York	13,000	12,900
Ohio	8,900	8,500
Oklahoma	399,200	399,050
Pennsylvania	34,000	33,800
Tennessee	25	25
Texas	2,333,750	2,333,750
Tex. R. R. Comm. Districts:		
Dist. 1—South Central	24,275	24,275
Dist. 2—Middle Gulf Coast	160,675	160,675
Dist. 3—Upper Gulf Coast	499,875	499,875
Dist. 4—Lower Gulf-S.W.	247,600	247,600
Dist. 5—East Central	40,875	40,875
Dist. 6—East Texas Field	308,000	308,000
Dist. 6—Rest of Northeast	118,600	118,600
Dist. 7-B—North Central	40,975	40,975
Dist. 7-C—West Central	41,250	41,250
Dist. 8—West	637,650	637,650
Dist. 9—North	127,725	127,725
Dist. 10—Panhandle	86,250	86,250
Virginia	100	100
West Virginia	7,200	7,000
Wyoming	121,500	120,000
Total United States	5,202,000	5,206,350

Total stocks, foreign and domestic, September 13, 1947, as reported by the Bureau of Mines, were 226,509,000.

Atlantic Gulf Gas Would Be Operator of Proposed Line

Atlantic Gulf Gas Company, subsidiary of United Gas Corporation, has been proposed to the Federal Power Commission as operator of the lines for which United requested building and operating authorization last spring. The system which FPC has yet to approve involves the construction of approximately 1500 miles of natural gas line in various pipe sizes up to 26-in, extending from Hattiesburg, Miss., through southern Alabama and Georgia and the northern part of Florida and the southeastern part of South Carolina. Terminal points would be Georgetown, S. C., and Jacksonville, Fla.

These new pipe line facilities will include the construction of a 9000-horsepower compressor station near Andalusia, Ala. The line will take gas from United Gas Pipe Line Company's system, which is at present one of the country's largest, being linked to 124 gas fields and about 1650 wells in Louisiana, Mississippi and Texas. If the new line is approved it will furnish natural gas to an extensive area which has not had this service. The estimated annual volume of gas for both city gate and direct industrial sales delivery has been placed at approximately 67 billion cubic feet.

Directors of the new company are N. C. McGowen, also president; M. A. Abernathy and G. T. Neff, also vice presidents; A. D. Greene, R. O. Wilhelmi, and G. T. Neff, L. V. Tracht is treasurer of the company; J. H. Miracle, secretary; and George D. Fiser, assistant secretary.

Carthage Field-Longview Line Is Authorized by FPC

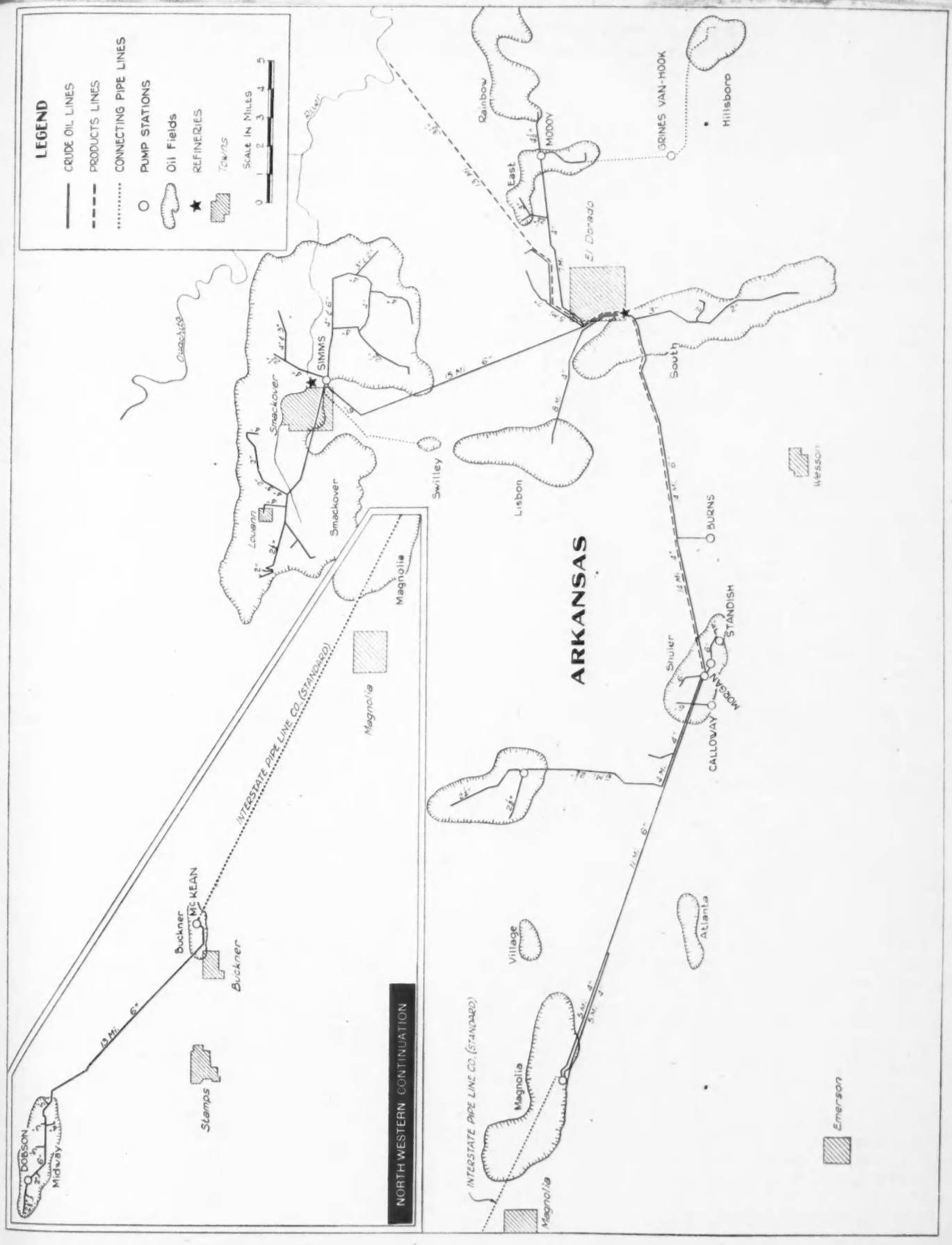
The Federal Power Commission has authorized United Gas Pipe Line Company to build about 33 miles of 20-inch line from the Carthage field, Panola County, Texas, to a point near Longview, at a cost of $1,730,000, to transport 100,000 Mcf daily of gas to Texas Eastern Transmission Corporation and also to transport for TET gas which it is to purchase from Lone Star Gas Company and the Chicago Corporation.

Mississippi River Fuel Asks To Hike Capacity of Line

Mississippi River Fuel Corporation has applied to FPC for authority to increase its pipe line capacity by 83 million cubic feet of gas. Construction would involve a series of loops to provide two separate lines from the Perryville compressor station to St. Louis, or about 190 miles of 22-inch line, 23 miles of 12-inch, and 11,000 additional horsepower for the Perryville, West Point, and Twelve Mile stations. Total cost of the project has been estimated at $11,083,715.

This additional line will improve delivery capacity in the Dallas district, compensating for a decline in delivery capacity from the Willow Springs and Hawkins fields.

Lion Oil Company



Condensate PRODUCTION AND CYCLING

By PARK J. JONES
Consultant

Part 7

Displacement of Gas by Water

SIMULTANEOUS production of condensate and utilization of residue gas usually is more advantageous than cycling. Gas utilization may be either sales gas or conversion to motor fuel or chemicals. A rich retrograde gas reservoir may be produced more profitably by maintaining pressure with injected water. The mechanics of gas displacement by water is reviewed in Part 7. The data herein presented will be applied in later articles.

A Uniformly-Permeable Section

A reservoir may have several thick intervals separated by impermeable breaks of appreciable thickness. The permeability and the rich gas initially in place can be mapped out and produced on a per-interval basis. But the individual intervals are made up of beds. The per-bed thickness may range from a fraction of an inch to possibly several feet. The beds may be separated by impermeable laminae. The permeability ratio as between beds in a given interval may be anywhere from 10-1000 in sandstone reservoirs and more than 1 million in limestone reservoirs having secondary porosity.

Pass a plane through a condensate reservoir at some level above the water contact. Permeability varies as between points on a section having a fixed structural position, that is, per-bed permeabilities are not uniform. First, consider the portion of a section which is limited to one thin bed and call this a uniformly-permeable section.

Relative Permeability

Force water into a uniformly-permeable section of rich gas pay. Then the cube root of the relative permeability K_w to water and the square root of the relative permeability to gas K_g are defined approximately[1] by the lines in Figure 7-1. The data are for a uniformly-permeable section which contains 17 percent interstitial water.

Figure 7-2 shows the approximate relative permeability to water and rich gas for a uniformly-permeable section which contains either 10 or 40 percent interstitial water.

For production purposes, relative permeabilities are expressed in terms of the fluid displaced. The data of Figure 7-1 are replotted in Figure 7-3 against displaced rich gas. Let C equal displaced rich gas. Then

$$K_g = (1 - C)^2 \qquad (1)$$

and

$$K_w = C^3 \qquad (2)$$

are the approximate[1] relative permeabilities. The curves in Figure 7-4 are solutions of the foregoing equations. The approximate relative permeability would be as indicated if the rich gas in a uniformly-permeable section were displaced by water.

Volume Percent Water

Let Q_g be the rate of rich gas production from a uniformly permeable section and Q_w, the rate of water production. Both rates are measured at reservoir pressure and temperature. The volume fraction W of water in production is defined by

$$W = \frac{Q_w}{Q_w + Q_g} = \frac{1}{1 + \frac{Q_g}{Q_w}} \qquad (3)$$

The rate of production of a given fluid from a section varies directly with the relative permeability to the fluid and inversely with the viscosity of the fluid. Accordingly, the volume percent water in the production from a uniformly-permeable section is defined approximately by

$$W = \frac{1}{1 + \frac{\mu_w}{\mu_g}\cdot\frac{K_g}{K_w}} = \frac{1}{1 + \frac{\mu_w}{\mu_g}\cdot\frac{(1-C)^2}{C^3}} \qquad (4)$$

The curves in Figure 7-5 are solutions of equation (4). The rich gas displaced from a uniformly-permeable section is plotted against volume percent water for 10 and 40 water-gas viscosity ratio.

Volume Percent Rich Gas

The volume fraction G of rich gas in the production from a uniformly-permeable section is given by

$$G = \frac{Q_g}{Q_g + Q_w} = \frac{1}{1 + \frac{Q_w}{Q_g}} = \frac{1}{1 + \frac{\mu_g}{\mu_w}\cdot\frac{K_w}{K_g}}$$

Hence,

$$G = \left[1 + \frac{\mu_g}{\mu}\cdot\frac{C^3}{(1-C)^3}\right]^{-1} \qquad (5)$$

Water Requirements

Let W_o represent the cumulative water production expressed as a multiple of the rich gas initially in place. The increase dC of cumulative rich gas recovery from a section divided by the increase in total production $d(C + W_o)$ is the fraction of rich gas in production, that is,

$$\frac{dC}{d(C + W_o)} = G$$

and

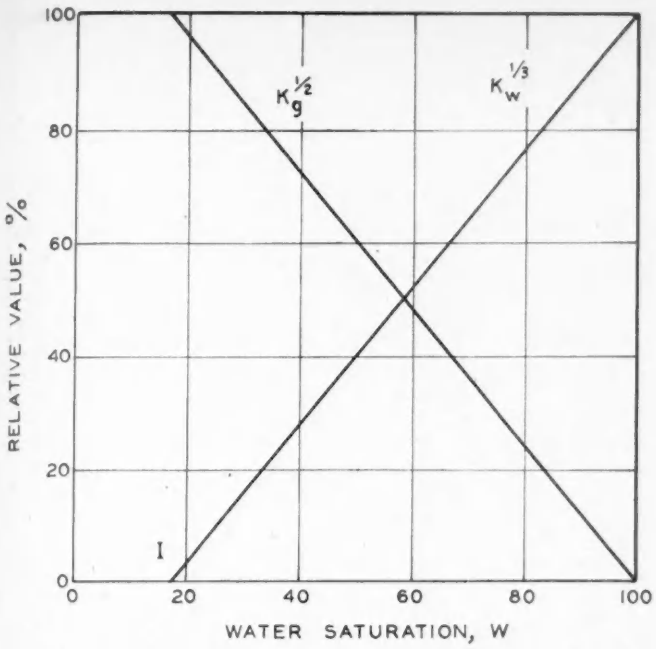
$$C + W_o = \int \frac{dC}{G} \qquad (6)$$

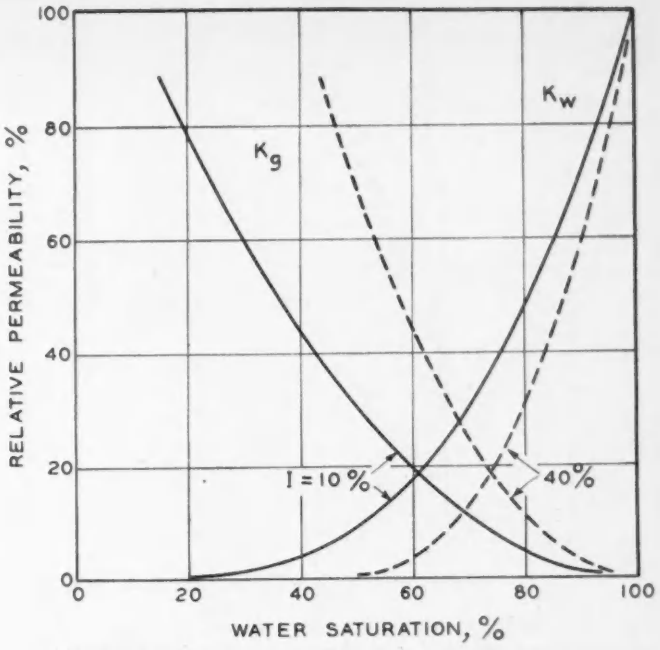
Upon substituting the right side of equation (5) in (6), we have

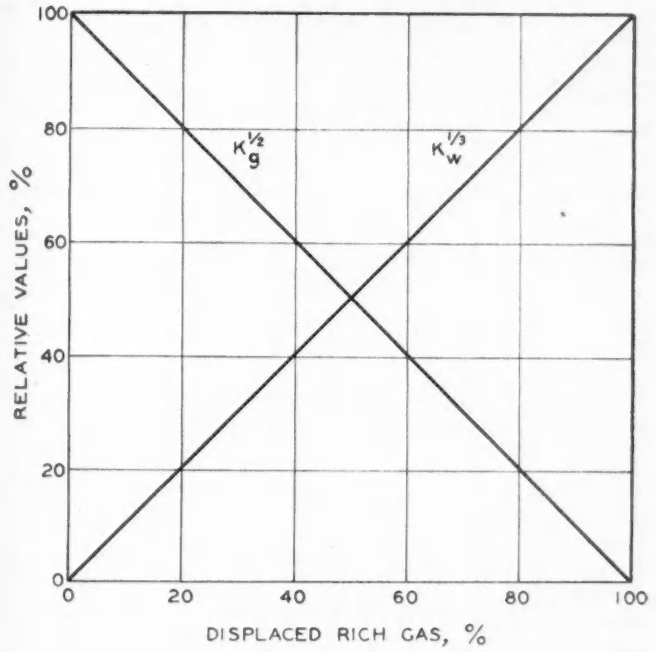
$$W_o = \frac{\mu_g}{\mu_o}\int_0^C \frac{C^3 dC}{(1-C)^3}$$

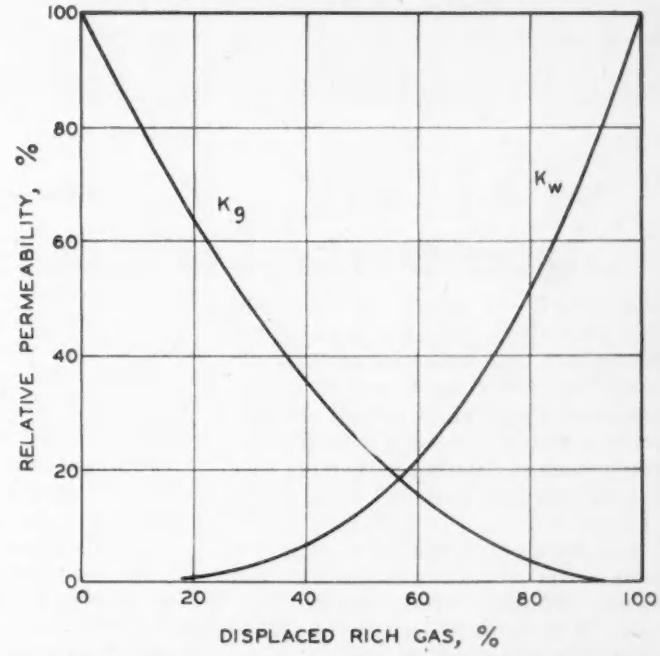
from which

$$W_o = \frac{1}{2}\cdot\frac{\mu_g}{\mu_w}[(1-C)^2 - 6(1-C) + 6$$









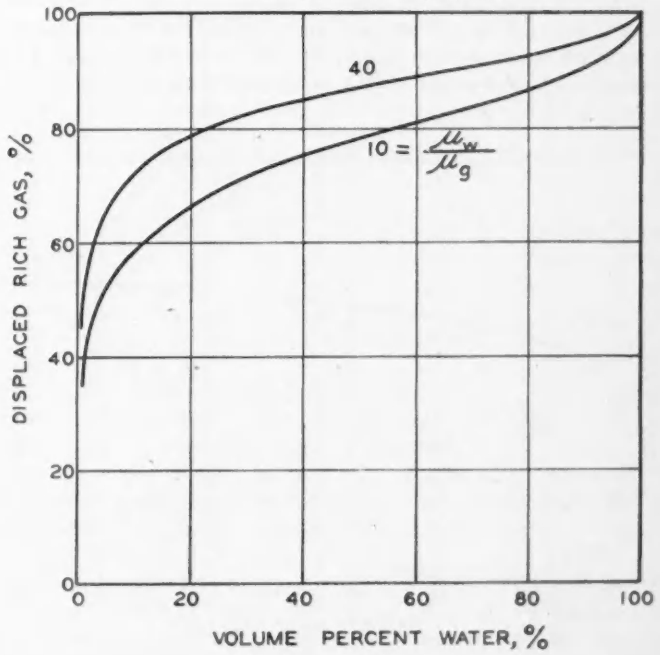


Figure 7-1 (top left). Cube root of relative permeability to water and square root of relative permeability to gas vs. water saturation in a uniformly permeable section containing 1 percent interstitial water.

Figure 7-2 (top right). Relative permeability K_w to water and K_g to gas for displacement of gas by water from a uniformly permeable section having either 10 or 40 percent interstitial water.

Figure 7-3 (center left). Cube root of relative permeability K_w to water and square root of relative permeability K_g to rich gas vs. displaced rich gas for a uniformly permeable section.

Figure 7-4 (center right). Relative permeability to water and to rich gas vs. displaced rich gas for a uniformly permeable section.

Figure 7-5 (right). Displaced rich gas vs. viscosity ratio and volume percent water in the production from a uniformly permeable section.

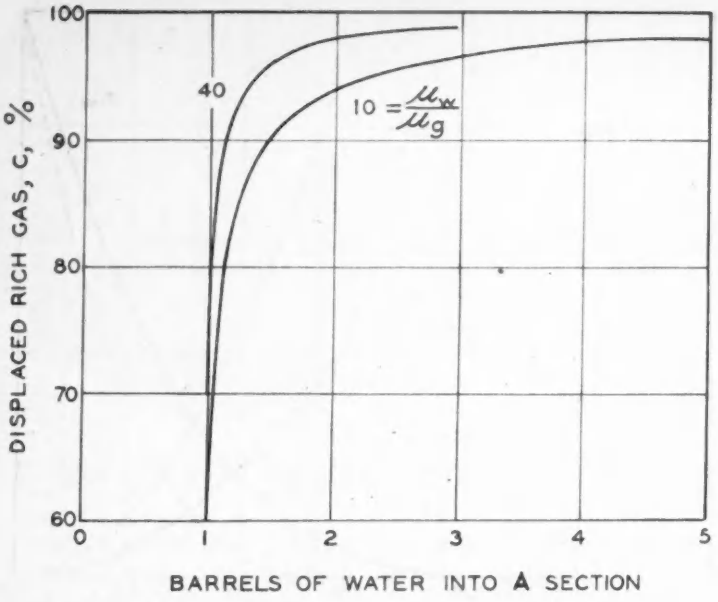


Figure 7-6. Barrels of water required to displace one particular barrel of rich gas from a uniformly permeable section for either a ten or 40-viscosity ratio.

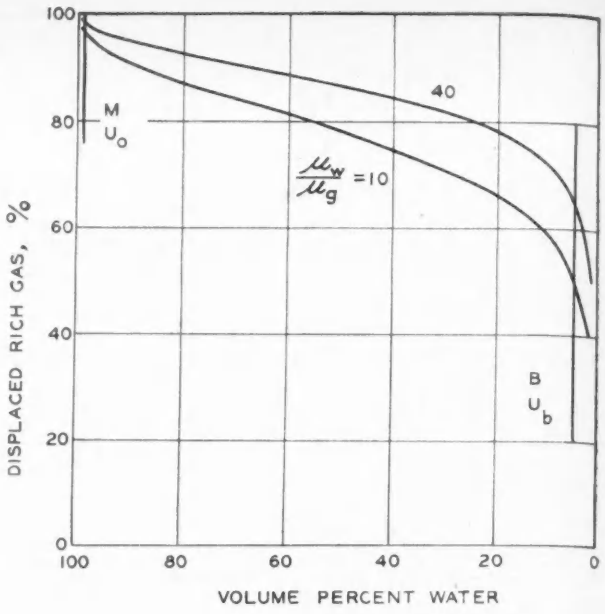


Figure 7-7. The maximum recovery U_o from an M section and the breakthrough recovery U_b from a B section.

$$\log(1-C) + 2(1-C)^{-1} + 3]$$

or

$$W_o = \frac{\mu_g}{\mu_w}\left[\frac{6C - 3C^2 - C^3}{2(1-C)} + 3\log(1-C)\right] \qquad (7)$$

where log is the natural logarithm and W_o is barrels of water per barrel of displaced rich gas measured at reservoir conditions. Add C to W_o and obtain the barrels of water into a section per barrel of displaced rich gas. The total water requirement in barrels per barrel of rich gas at reservoir conditions is given by $(1 + W_o/C)$.

The curves in Figure 7-6 show the total water requirements for a uniformly-permeable section and viscosity ratios of 10 or 40. Displaced rich gas is plotted against total volume of water into a section. About 98 percent of in place rich gas can be displaced with a volume of water equal to 3-5 times the volume of initially in place gas in a uniformly permeable section.

The B and M Sections

Figure 7-7 shows rich gas recovery in terms of volume percent water in the production from a uniformly-permeable section. The breakthrough section B is taken at five volume percent water in production. The intersection of the B line with the curves in Figure 7-7 shows U_b the breakthrough gas recovery.

The section M of maximum recovery is taken at 99 volume percent water in production. The intersection of the M line with the curves in Figure 7-7 shows U_o the maximum rich gas recovery. That is, the ultimate recovery from a section of pay through which a sufficient volume of water was forced is not likely to be less than U_o.

The breakthrough and maximum recoveries from a section may be expressed in terms of viscosity ratios. By equation (4), we have

$$\frac{100}{1 + \frac{\mu_w}{\mu_g} \cdot \frac{(1-U_b)^2}{U_b^3}} = 5$$

which gives

$$\frac{(1-U_b)^2}{U_b^3} = 19\,\frac{\mu_g}{\mu_w} \qquad (8)$$

For the conservative maximum recovery, we have

$$\frac{100}{1 + \frac{\mu_w}{\mu_g} \cdot \frac{(1-U_o)^2}{U_o^3}} = 99$$

which gives

$$\frac{(1-U_o)^2}{U_o^3} = 0.01\,\frac{\mu_g}{\mu_w} \qquad (9)$$

The curves in Figure 7-8 are solutions of equations (8) and (9). Evidently, the ultimate or maximum gas recovery by water from a section is about 98 percent of initially in place gas irrespective of viscosity ratio. The breakthrough recovery is defined approximately by

$$U_b = 45 + 3\left(\frac{\mu_w}{\mu_g}\right)^{\frac{1}{2}} \qquad (10)$$

where U_b is in percent of in place gas.

The above data will be applied in later articles to condensate production by pressure maintenance with injected water.

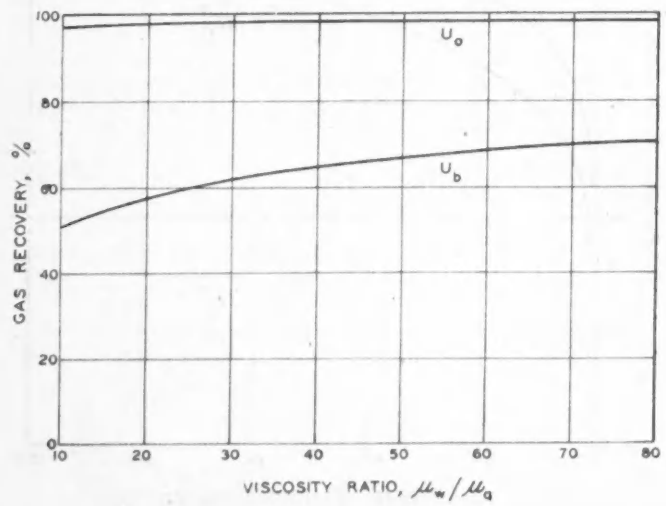


Figure 7-8. Maximum and breakthorugh recoveries vs. viscosity ratio.

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[1] Jones, Park J., Vol. I, Mechanics of Production, Reinhold Publishing Corp., New York, 1946.
[2] Pew and Dotterweich, The Oil Weekly, April 17, 1944.

Figure 1. Well-head attachment, containing sound-impulse chamber and amplifying device for converting sound into electrical impulses for the recording instrument. The unit may be tied in on any well-head opening without disrupting flow connections.

Acoustic Well-Depth Indicating

By ALEXANDER WOLF, Ph. D.,
Vice President, Keystone Development Corporation

DEPTH-MEASUREMENT of the fluid level in a well, made while the well is on production or shut in, is frequently desired to help solve production problems. Theoretically, determination of the depth is possible by measuring the reflection of sound from the fluid, but gas densities and other considerations sometimes combine to complicate the calculations beyond workable limits. In his description of a new device for determining fluid depth, the author, a consulting physicist who has specialized on acoustics, draws on his field experience and illustrates the article with an actual well reading.

ECONOMICAL operation of oil property is fundamentally based on knowledge of the many factors affecting production. One of the most important of such factors, particularly during the artificial-lift stage, is the position of the fluid column in each well.

In a well which has been shut down for stabilization, the position of the fluid column is a measure of bottom-hole pressure. In a well produced at different rates, the variation in the position of the fluid column is a measure of the productivity index. At other times measurement of the depth to to the top of the fluid may have a bearing on the setting or adjustment of a pump, or on the design of a gas-lift installation. It is fortunate that accurate determination of the fluid level in a well can be made by means of a sound pulse, usually without any interruption of normal operations.

"Sound-Log"

No equipment of any kind need be lowered into the well. The explosion of a blank cartridge in a small gas-tight chamber attached to the well-head creates a sound which travels down the annular space between the tubing and the casing. On the way down the sound is partially reflected by each of the tubing collars and any other partial obstructions, and almost totally reflected by the top of the fluid. The reflected sound is picked up and recorded at the surface of the ground on a moving strip of paper by means of suitable apparatus also attached to the well-head. The chart which is obtained might be called a "sound-log" of a well by analogy with the electrical log. The chart shows the instant of the explosion, which corresponds to the top of the well, a succession of tubing collar reflections, which correspond to the depth-marks on an electrical log, and finally a strong reflection from the top of the fluid.

The fluid is thus located relative to the nearest tubing collar. Any partial obstructions, such as gas-lift valves, tubing catcher, etc., are located in a similar manner. If their position is known they serve as a check on the count of the tubing collars.

Origin of Idea

The idea of locating obstructions in pipes by means of a sound-pulse and as-

sociated echoes is not new. Almost 50 years ago a patent was issued to B. C. Batcheller (U. S. Pat. 602,422) to cover the firing of a blank pistol cartridge into a pipe and the recording of the ensuing events on a moving strip of paper. It is not clear what use, if any, Batcheller made of his now long-expired patent. It was not until more than a quarter of a century later that Union Oil Company, and subsequently Shell Oil Company, applied Batcheller's idea to the location of fluid in a producing well.

These devices, developed in the late 1920's and early 1930's, were successful but not sufficiently accurate, because they attempted to calculate the position of the fluid from the transit time of the sound and from the sound velocity. Unfortunately, it was found that sound velocity varies radically from well to well, and does not even remain strictly constant in the same well under different operating conditions. For a short time attempts were made to develop a convenient means for the measurement of velocity in the well gas, but these attempts were abandoned when it was realized that with suitable apparatus one could record consistently a sufficient number of tubing-collar reflections. These reflections then form a natural scale against which to locate the strong reflection from the fluid. One might liken the situation to the solution of the hypothetical problem of determining the height of a fireman above the ground. The "scientific" approach would be triangulation with chain and transit (with a considerable probability of error); the common-sense approach would be visually to count the number of ladder rungs between the fireman and the ground, and to multiply this number by the

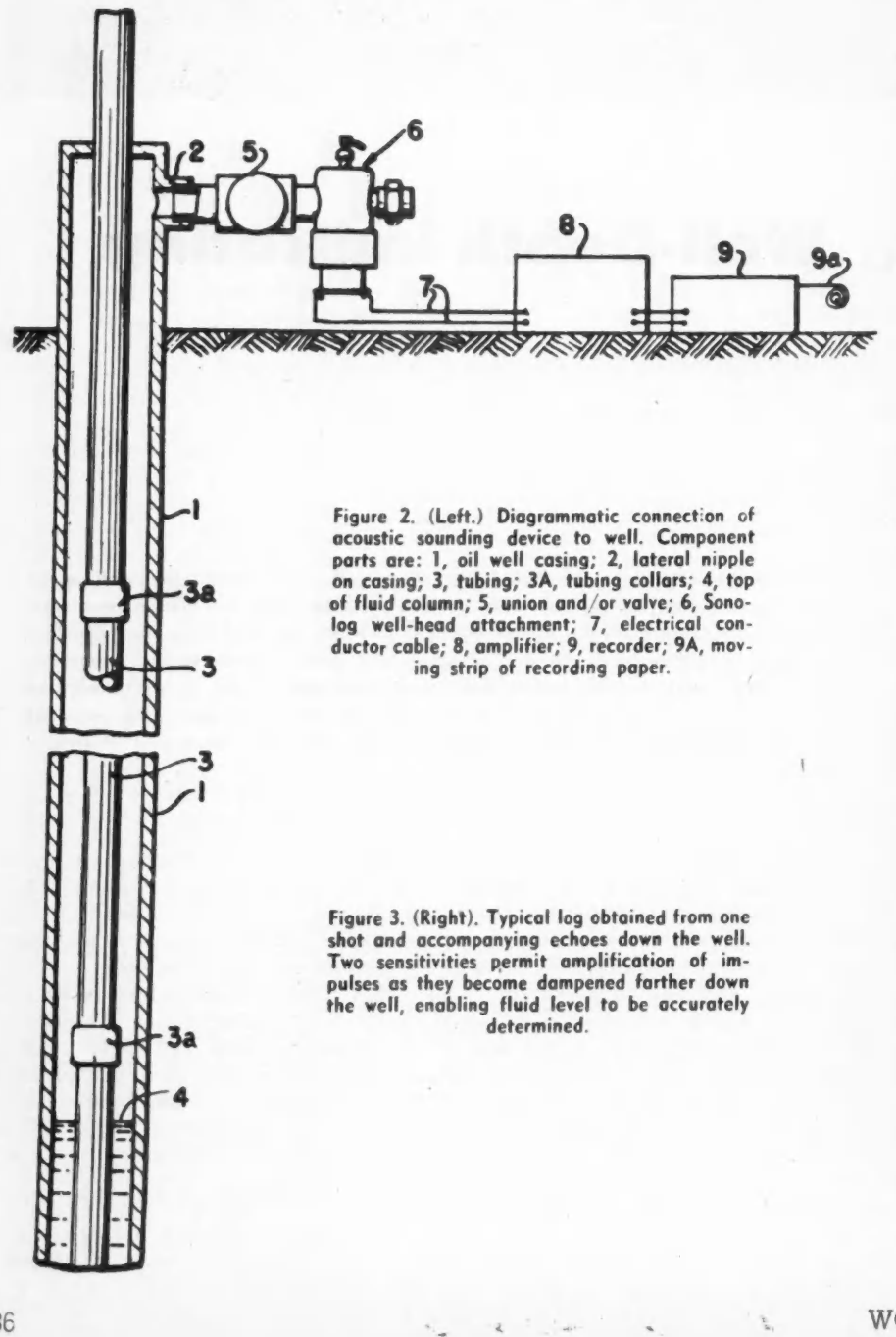
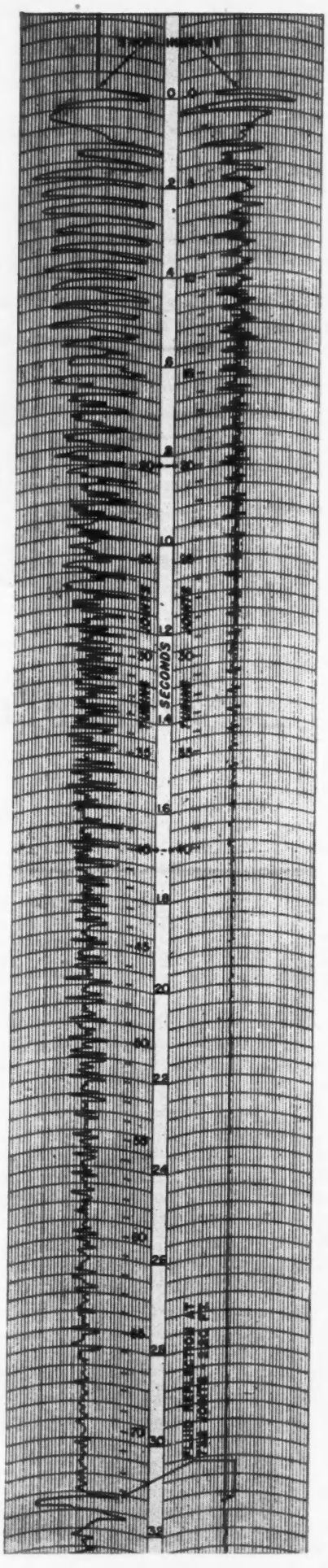


Figure 2. (Left.) Diagrammatic connection of acoustic sounding device to well. Component parts are: 1, oil well casing; 2, lateral nipple on casing; 3, tubing; 3A, tubing collars; 4, top of fluid column; 5, union and/or valve; 6, Sonolog well-head attachment; 7, electrical conductor cable; 8, amplifier; 9, recorder; 9A, moving strip of recording paper.

Figure 3. (Right). Typical log obtained from one shot and accompanying echoes down the well. Two sensitivities permit amplification of impulses as they become dampened farther down the well, enabling fluid level to be accurately determined.



space between the rungs. This is what is done in acoustic well-sounding.

While all acoustic well-sounders are similar in principle, several types have been built in the past. Two of these are offered to the industry at large, but only on a service basis, and more rarely for long-term rental. In addition two major oil companies built similar instruments for their own use. One of these companies operates about five, the other about ten well-sounders on their own properties.

Varied Uses

It is interesting to inquire the reasons why two oil companies require 15 instruments between them, while the balance of the industry seems to get along with outside services. The answer, based on the writer's experience with one of these oil companies, is that the uses of an acoustic well-sounder are many and varied, sometimes quite subtle, and seldom fully realized until the instrument is handed directly to the field engineer or foreman. The instrument replaces much guesswork with actual knowledge.

In addition to the more generally recognized applications, the instrument answers many questions which at first appear to be of minor nature, which would not perhaps justify the calling of an outside service with the attendant extra expenditures, submission of reports, et cetera. Yet the successful solution of these many minor difficulties which occur daily in any operating district looms large in the ultimate economics of field operation. Strange as it may seem, the instrument has formed the foundation for more intimate cooperation between the engineering staff and the men whose knowledge is based on practical experience.

An instrument to be operated by any field engineer (pumpers have operated one such instrument very successfully) must give the primary consideration in its design to portability and ease of operation. The complete Sonolog instrument, a photograph of which is shown in Figure 4, is made of three components: the well-head attachment, the amplifier-recorder, and the power converter. The instrument can be carried in a passenger automobile without any special mounting; such mountings would impair the use of the car for other purposes. If necessary, the instrument can be carried by hand, since the heaviest component, the amplifier-recorder, weighs a little less than 50 pounds, including the small trunk in which it is housed. The power required for the operation of the instrument can be drawn from any six-volt storage battery, usually the automobile battery.

As can be seen in Figure 1, the only part of the instrument which is mounted on the well is the well-head attachment.

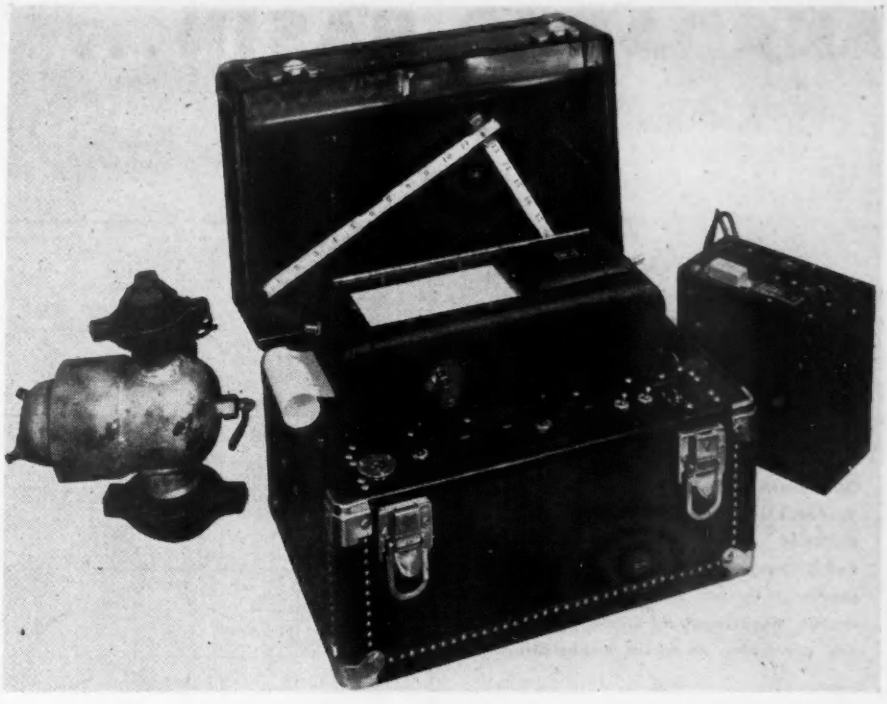


Figure 4. The three parts of the complete sound-measuring unit. At left is the well-head attachment, in the center the amplifier-recorder, and at the right the power converter, which changes the six-volt d.c. current to 110-volt a.c. for operating the unit.

This component is connected to one of the casing outlets by means of a conventional union, as shown schematically in Figure 2. It contains the mechanism which fires a blank cartridge, and also the microphone which converts the sequence of sound pulses into electrical impulses. These are led by wires to the amplifier-recorder, which usually is left in the car. The amplifier steps up the weak electric currents to the level required for the operation of two pen-and-ink recording galvanometers which produce the final chart of the various echoes. A typical record is shown in Figure 3.

It will be noted that two traces are recorded simultaneously. The one on the right, operating at a relatively low sensitivity, records more clearly the uppermost tubing collars, while the trace on the left, operating at a higher sensitivity, is better for the deeper collars and for the fluid reflection. It is this employment of two traces which makes it possible to dispense with an expert operator, because it eliminates the need for any critical adjustment. The third unit of the Sonolog, the power converter, merely changes the six volts direct current of the storage battery into 110-volt alternating current, required for the operation of the amplifier and the synchronous motor which drives the chart.

One-Man Operation

The unit can be operated easily by one man, who needs only close one switch and pull the trigger on the firing mechanism. The latter can be done from some distance by means of a cord attached to the trigger. The only adjustment required on each well is the setting of two sensitivity controls, neither of which is particularly critical. The actual taking of a record consumes, of course, only a few seconds. Since the record is in ink on plain paper, no processing of any kind is involved. Where wells are readily accessible and pressures low, the entire operation, including mounting and dismantling, can be carried out in less than 15 minutes. The operating expenses are nominal.

The art of interpreting the records is easily acquired, since it consists of nothing but a recognition of the fluid reflection and other obstructions, and of the rhythmic pattern of collar reflections. The record reproduced in Figure 2 is fairly typical of a pumping well in which the fluid is found at about 2000 feet. Repeated echoes may be obtained in a well in which the fluid level is very shallow and each repetition affords a check of the tubing collar count. Reflections also may be obtained from gas-lift valves or from other obstructions in the well; these reflections are readily distinguished from the tubing collars and from the fluid reflection at the lower end of the record.

A precision well-sounding instrument should yield valuable operating data for petroleum engineers, whether such equipment is used on a service basis, on long term lease or purchased for use by the oil operators' own personnel, depending upon the particular requirements involved.

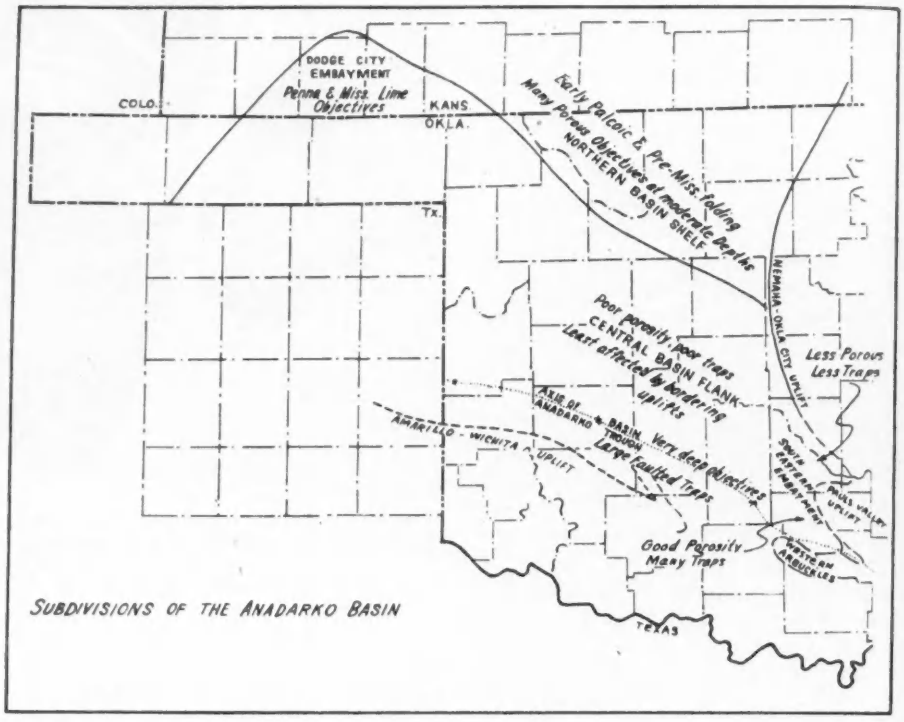
ANADARKO BASIN...

Geology and Oil Possibilities

By ROBERT R. WHEELER
Consulting Geologist,
Oklahoma City, Oklahoma

THIS FIRST of four articles concerning the Anadarko Basin of western Oklahoma is a genetic or historical geologic approach to basin oil possibilities, to provide generalized definitions of the major geologic subdivisions of the basin and to review the history of changing ideas and programs of basin exploration.

Part 1



SUBDIVISIONS OF THE ANADARKO BASIN

Figure 1.

THE many dry holes drilled in the Anadarko Basin of western Oklahoma, several of them on closed seismic prospects, impress on us the fact that a structural trap is only one of several factors essential for oil accumulation. Even the most practical geologist is obliged to consider theories regarding the distribution of porous reservoir rocks and the relation of these to source beds and traps. Certainly, problems of porosity, date and distance of oil migration and age of folding should be important considerations in the search for basin oil.

These factors are related to the geologic history of the region and, in this genetic approach to the oil possibilities, the evolution of the Anadarko Basin is described with reference to the orogenic movements of the bordering positive areas to which the basin structures, unconformities and sediments owe their origin. It is evident that the central Kansas and Ozark highlands to the north and east were repeatedly uplifted prior to the initiation of the Arbuckle-Wichita-Amarillo fold system. Thus, the Anadarko Basin came into existence as a subdivision of a much larger southern Oklahoma geosyncline and was further modified during Pennsylvanian and Permian times to create additional combinations of structure and stratigraphy conducive to oil accumulation.

As a consequence of these various ages and mechanics of structural movement, the Anadarko Basin affords oil possibilities that range from Cambrian to Permian. Production from these is distributed over a vast area from the southeastern apex of the basin (the Elmore Embayment of Garvin County), northwestward along the Arbuckle and Wichita Mountain fronts into the Oklahoma Panhandle and eastward around the Dodge City Embayment of southern Kansas to include the west flank of the Nemaha Ridge which bisects much of northern Oklahoma.

Geologic Provinces of the Basin

It is estimated on seismic data and by the adding up of exposed and penetrated subsurface stratigraphic units that the pre-Cambrian basement rocks lie approximately 28,000 feet deep in the trough of the Anadarko Basin in southeastern Washita County. Less than 15 miles south the granite basement rocks are at shallow depths or exposed along the Wichita Mountain front, indicating a structural relief and the truncation of a thickness of more than five miles of Cambrian to Permian sediments. In contrast, these rocks thin much more gradually northward toward the granite core of the central Kansas Uplift with about 6000 feet of sediments still preserved at the Oklahoma-Kansas boundary. They likewise thin eastward toward the Nemaha Ridge which roughly bisects the north half of the state into a western basin and an eastern shelf associated with the Ozark Uplift of northeastern Oklahoma.

The Nemaha Ridge culminates southward in the Oklahoma City Uplift, properly described as a buried mountain comparable in magnitude with segments of the Arbuckle Mountains to which it is closely related in age and mechanics of structure. In fact, the Oklahoma City Uplift is connected with the northern Arbuckle, Pauls Valley Uplift, by an extensive plateau which separates the Anadarko Basin from the McAlester Basin of southeastern Oklahoma. Mississippian limestones and thick early Pennsylvanian sediments that are present in the adjacent basins are truncated on this plateau, which is capped by Woodford shale and overlapped by Middle Pennsylvanian and later rocks. Thus, the Anadarko Basin is conveniently delimited to the southeast by the general Oklahoma City Uplift, the Pauls Valley Uplift, and the western Arbuckle Mountains.

Far to the northwest, an embayment of the basin extends into western Kansas where preservation of relatively thick Mississippian and Pennsylvanian sediments had led to the term Dodge City Basin. These rocks thin westward across the Oklahoma Panhandle into southeastern Colorado where the limits of the

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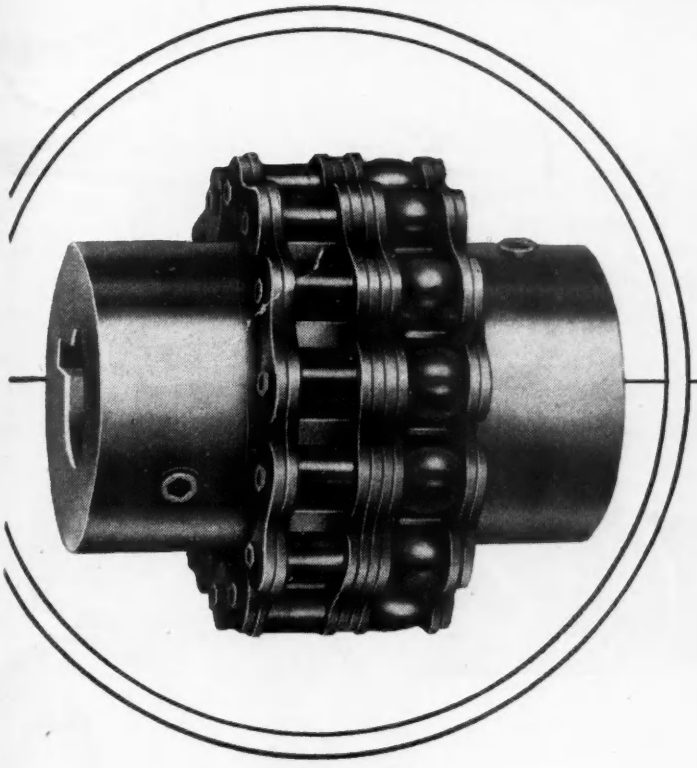

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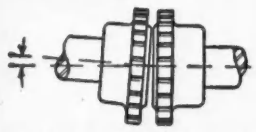

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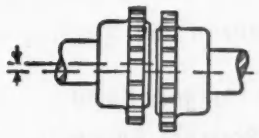
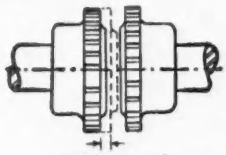


RADIAL MISALIGNMENT



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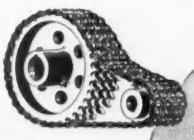

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basin cannot yet be defined. Neither has the northwestern extension of the Wichita-Amarillo Uplift bordering the basin on the southwest been defined. At least, it is apparent from the thinning and dolomitization of the Ordovician sections and from the abundance of arkose in the Pennsylvanian rocks that the northwestern region underwent both early and late Paleozoic uplifts in proximity to areas of exposed granite. Yet the presence of earliest Pennsylvanian sediments in Cimarron and Baca counties and the absence of these to the east suggests that a late Mississippian barrier separated the Anadarko Basin from the recently recognized eastern Colorado basin.

The influence of these bordering positive areas is apparent in the character of deposition, in the development of structural features and in the distribution of oil possibilities. Hence, it is convenient to subdivide the basin into geologically defined provinces. These are named and discussed as follows (see Figure 1):

1. The Anadarko Trough.
2. The southeastern Embayment.
3. The central Basin Flank.
4. The northern Shelf.
5. The Dodge City Embayment.

The Anadarko Trough. The basin is asymmetric in profile with a very steep south flank, associated with the faulted Wichita and Arbuckle Mountain fronts, and a relatively gentle north flank. The resultant basin axis rises southeastward toward the Pauls Valley-Arbuckle uplifts and northwestward into the Texas Panhandle creating a deep trough in Caddo, Washita and western Grady counties. This Anadarko Trough contains early Pennsylvanian rocks that are not present elsewhere in the basin. Structurally, it is characterized by large, more or less isolated northwest trending structures related to Wichita Mountain folding and faulting. In fact, no consistent differnetiation is possible between mountain front and deep basin structures. For example, the Cement fault-block, with a fairly complete Pennsylvanian sequence, seems isolated from the mountains proper by a prong of the basin, whereas the overturned Apache fold to the west is structurally many thousands of feet higher with the Pennsylvanian truncated from its crest. It is not so obviously dissociated from the mountain axis. Structures in the trough are commonly faulted with several hundreds of feet of closure, steep flanks, and their crests truncated by early and late Pennsylvanian movements. Here the base of Pennsylvanian lies at a maximum depth of about 18,000 feet.

The Southeastern Embayment. As the basin axis rises to the southeast it becomes more and more involved in Arbuckle folding and faulting by which, in succession, the early Pennsylvanian, Mississippian, Hunton and Ordovician rocks were beveled off on the flanks of the Pauls Valley and western Arbuckle uplifts. The intention here is to include not only the Elmore Embayment[1] that constitutes the southeastern apex of the basin, but also the down-faulted area lying between the southwest flank of the Oklahoma City Uplift and the north flank of the Pauls Valley Uplift. Here thick Pennsylvanian and older sections were preserved in spite of local faulting and uplift. The great abundance of intersecting faults with structurally and stratigraphically trapped oil objectives at penetrable depths distinguishes this southeastern Embayment as especially favorable for exploration.

The Central Basin Flank. Probably the least known province of the basin is the vast area north of the Anadarko Trough and south of a northern platform area marked by extensive pre-Mississippian truncation. By this definition it is intended to designate a central undisturbed region where the pre-Mississippian sequence is fully preserved except for local anomalies. Although the Hunton thickens southwestward from the belt of complete section (about 400 feet thick where the Bois d'Arc is not truncated in the northern areas), this is a regional depositional change, which is true also of the underlying Ordovician sequence and is in significant contrast to the successive truncation of the Hunton, Sylvan, Viola, and Simpson rocks to the northeast.

It is implied by this definition that pre-Mississippian folding had little effect in localizing oil prospects in the Central Basin Flank. Likewise, the Pennsylvanian folding which originates to the south in the Wichita and Arbuckle uplifts dies out northward so that few closed structures or stratigraphic traps localized by unconformities are to be expected. The few wells drilled to date suggest that porosity is poor in the better-known oil objectives, some of which lie at excessive depths in much of the central basin area.

The Northern Shelf. Across most of the basin, the Middle Pennsylvanian rocks lie unconformably upon a great variety of older formations and since these (Deese) sediments reveal the large scale features of the region, their behavior presents the logical genetic basis for subdividing the basin. Thus, although the Ordovician rocks rise northward into Kansas with only a gradual flattening, the Mississippian and particularly the Pennsylvanian rocks tend to show an abrupt decrease in the rate of thinning, suggestive of a northern basin platform. As a consequence, facies changes from basinal sands to platform limestones in the Pennsylvanian create an unusual class of oil possibility. Here also early folding produced critical variations in Ordovician thicknesses while pre-Mississippian post-Hunton warping and truncation localized additional structural and stratigraphic traps. The Northern Shelf consequently offers a considerable range of oil objectives at reasonable drilling depths.

The Dodge City Embayment. Around the flanks of the Dodge City Embayment, southwest of the Central Kansas Uplift, the Mississippian rocks wedge out in belts of locally well-developed porosity and are overlapped by a relatively thick Middle Pennsylvanian sequence. These constitute the main oil objectives, for the thin underlying Ordovician section grades westward into a facies that has shown little porosity to date. It is not likely that the basal Pennsylvanian sand production to the west in the Keyes field of Cimarron County is related to either the Dodge City or the general Anadarko Basin, but is more likely an eastern Colorado facies. Crossing much of this northwestern region from north to south and probably contiguous with the genetically related Amarillo gas field is a Lower Permian lime to sift facies change localizing the enormous Hugoton-Guymon gas production. Realizing that the Permian rocks are now almost flat to the west in Cimarron County in spite of later Permian and more recent east tilting of the region, the writer suspects that this facies change to fine clastics is associated with an old regional barrier marking the northwestern flank of the Anadarko Basin. In connction with these theoretical considerations it is of economic interest to note that Lower Permian rocks to the west are not particularly silty and showed good porosity and gas in southwestern Morton County, Kansas.

Review of Basin Exploration

The existence of a major structural depression, the Anadarko Basin, bordering the north flank of the Wichita Mountains, was under discussion in the geological literature by 1926 when a preliminary map contoured on the base of the Enid group was prepared by Frank C. Greene and C. C. Toomey. It showed the center of the basin in northwestern Washita County, the axis extending northwestward into the Texan Panhandle, a steep south flank bordering the Wichita-Amarillo Uplift, and a more gentle arcuate north flank very similar to our recent subsurface maps of the Lower Permian.

While surface mapping has led by this time to the discovery of the Cement, Chickasha and Carter-Knox producing structures, these were not consciously described as part of the basin

nor was there any concept of the tremendous thicknesses of older rocks lying beneath the shallow Permian and Pennsylvanian producing zones. During the late 1920's quite a few surface prospects farther east in Grady, McClain and Garvin counties were leased and drilled to shallow depths, rarely penetrating the Upper Pennsylvanian, and were abandoned with little realization of the underlying possibilities. Nevertheless, choice acreage on the more pronounced surface highs has been held for 20 years by a few operators who are only recently benefitting from deeper production and a rejuvenation of interest in the old surface prospects.

Boom and Depression Years

Surface mapping and core-drilling gradually extended during the 1920's from the shallow production in north-central Oklahoma into the western counties. This exploratory program was climaxed by Sinclair Oil & Gas Company's gas-distillate discovery in southwestern Harper County and by a fast lease play during the boom years in which an estimated one-fourth of Woods and adjacent portions of Harper and Woodward counties were leased at a dollar bonus and dollar annual rentals. Acreage was held in solid, well-defined blocks by Indian Territory Illuminating Oil Company, Sinclair, Dixie Oil Company, Cosden Oil & Gas Company, Prairie Oil & Gas Company, Gypsy Oil Company, Bu-vi-bar and other independents. In 1927 Peerless drilled a failure in T. 28 N,. R. 16 W., followed by Sinclair and Bu-vi-bar to the south. Close-in royalty prices, however, had risen to $100 and $200 per acre, probably as high as any paid since in the northwestern counties.

During this early leasing campaign Sinclair and others extended the play as far south as northcentral Dewey County with much acreage bought on early (reconnaissance) seismograph mapping. Also numerous blocks were assembled by ITIO, Roxana, Amerada and others in Custer and Roger Mills Counties. Practically all of this far western acreage was dropped without any important drilling accomplished and the area has never been active since.

By 1932 and the succeeding depression years some of the northwestern acreage was dropped even after a successful campaign for reduced rentals (to 25 cents) and as the ten-year leases expired in the late 1930's, leasing and drilling continued only in a desultory manner until World War II.

The Deep Tests

It was not until 1933 when the Denver Producing Company found porous sands and boiling salt-water at 13,000 feet still in Pennsylvanian rocks in central Caddo County that geologists began to appreciate the magnitude of the Anadarko flexure. Later, in 1940, Continental Oil Company abandoned Proctor 1 at 14,582 feet without having reached pre-Pennsylvanian rocks in western Washita County. As subsurface correlations were revised and the Chitwood production subsequently was developed south of Chickasha by Magnolia at depths approximating 11,000 feet in the lower Pennsylvanian, the Ordovician oil objectives began to appear unpenetrable. However, in early 1946, The Superior Oil Company, with one of the heaviest duty drilling rigs in existence, undertook to reach the Ordovician estimated on seismic mapping at about 19,000 feet. At 17,823 feet, far below previous drilling depth records, Superior decided to test its Weller 51-11, NW NW NE Sec. 11-8n-12w, up the hole so as to not further jeopardize Pennsylvanian shows.

Evidently the oil industry has still failed to impress the Caddo Indian who undertook to translate the fee name of Denver's original deep basin wildcat: Ada Noe in the Caddo dialect is alleged to mean "turkey-droppings."

The 10-Cent Dollar Period

Early in the war two geologic concepts and the excess profits tax revived interest in the entire Basin and initiated a competitive leasing program whose areal extent has never been duplicated in the Mid-Continent.

When the geological fraternity finally comprehended that the production in West Edmond was localized along the wedge-edge of the Hunton group, it quickly abandoned the embarrassment inflicted by Ace Gutowsky's "doodlebug"-inspired discovery well and projected the belt of Hunton truncation northwestward across the basin. This roughly mappable trend guided the early leasing which, more out of momentum than geologic conviction, spread across most of the northwestern counties. But also in late 1943 and 1944 the South and West Moore fields were discovered in Pennsylvanian and Wilcox sands downfaulted on the southwest flank of the Oklahoma City Uplift.

For some reason (non-geological), it became popular to regard this as a graben and subsequently the craze for grabens almost obscured the search for anticlinal varieties of oil accumulation. But, at least, geologists appreciated that the prolific Simpson sands were developed along with structural traps in the Basin. Before the east-west alignment of South and West Moore was generally recognized many geologists inferred that structural trends would be found in the Basin paralleling the Nemaha Ridge. Their recommendations for seismic mapping and protection acreage decidedly affected the great northwestern lease play.

The third factor that ramrodded the buying campaign was the industry's reaction to the excess profits tax. Exploration policy was based more on an abundance of so-called "10-cent dollars" and the availability of war profits from manufacturers than on any local or general geologic prospects. At this date, at least 50 percent of the northwestern area, including parts of the Oklahoma Panhandle, is under lease, some of it held in more or less solid blocks but most of it checkerboard holdings.

Also during the northern basin campaign, as deeper basin prospects seemed uneconomic, attention was suddenly focused on the southeastern Basin areas by discovery of the Lindsay pool in 50n-4w. Here, the abundance of structural traps and the presence of numerous oil objectives led in the last two years to proven Ordovician, Hunton or Pennsylvanian production in eight different oil fields, marking this province as the most attractive in the Basin.

Recent Trends

Only lately, as the cost and unavailability of leases limited buying in the southeastern province, has attention again been revived in the northern Basin areas. Here basal Pennsylvanian (Ringwood pool), Mississippian and Simpson (Olson Ott 1) production has encouraged more detailed seimic work and drilling.

In review, it appears that expected recoveries will not encourage drilling below 15,000 feet in deeper basin areas where early Pennsylvanian sands will be the main objective. Across the north flank of the basin a major exploration program is inevitable, especially in Alfalfa and adjacent counties where reservoir rocks are particularly favorable. But the vast interior of the Basin with the least expectations of stucture and porosity will be the last to be adequately explored.

Finally, where Pennsylvanian (Deese and Springer sands), the Hunton and Viola limestones and Simpson sand production are proven objectives in the Southeastern Embayment, drilling will accelerate as subsurface techniques and more detailed shooting unravel the complexities of fault-block and stratigraphic trap possibilities. Here important economic factors (since removal of the excess profits tax) will be fluctuations in the present high price of crude and the desirability of evaluating expensive lease acquisitions.

Reference

[1] Wheeler, Robert R.: Elmore Embayment, Garvin County, Oklahoma. Bull. Amer. Assn. Petr. Geol. Dec. 1946, p. 2034.

THE MASS SPECTROMETER

In Gas Analysis

THE mass spectrometer, one of the newer analytical instruments, has shown itself to be a remarkably useful apparatus in the analysis of gases and complex mixtures of gases. Many industries, such as gas, petroleum, chemicals and rubber rely heavily on gas analysis, and any improvement in methods or apparatus is of far-reaching importance. Although established chemical methods have long yielded valuable information concerning compositions of gases, they have serious limitations. The mass spectrometer offers an entirely new and different instrument for this type of analysis. It can in one operation resolve a very complex mixture of gases in a few moments of instrument time, although subsequent computing may require hours or even days, depending upon the complexity of the mixture and the method of computation employed.

The nearest approach to a real qualitative and quantitative system of gas analysis that has yet been devised is offered by the mass spectrometer. Gas analysis is in some respects the most curious branch of analytical chemistry. No other kind of analysis of equal importance is so totally devoid of a definite system. When a mineral is analyzed, there is a qualitative system for discovering the elements and radicals present, and a quantitative system for determining the amounts of each. But when a gas mixture is analyzed by the conventional volumetric chemical methods, the kinds of gas present are deduced from typical reactions, which, themselves are designed to disclose the amounts of these gases. In many cases the identifying reaction is not sufficiently specific to resolve the mixture to its actual components. Thus, combustion methods are incapable of identifying or estimating more than two hydrocarbons of a related series in any one sample.

The mass spectrometer separates various gases on the basis of the actual weight of the ions characteristically produced on dissociating each molecular species by electron bombardment. In many instances such a separation affords a clearcut identification of each component of the mixture. Usually the quantitative resolution of the mixture may be achieved by the proper mathematical treatment of the spectrometer data; and often the qualitative and quantitative processes are simultaneously conducted as in the case of the older chemical methods.

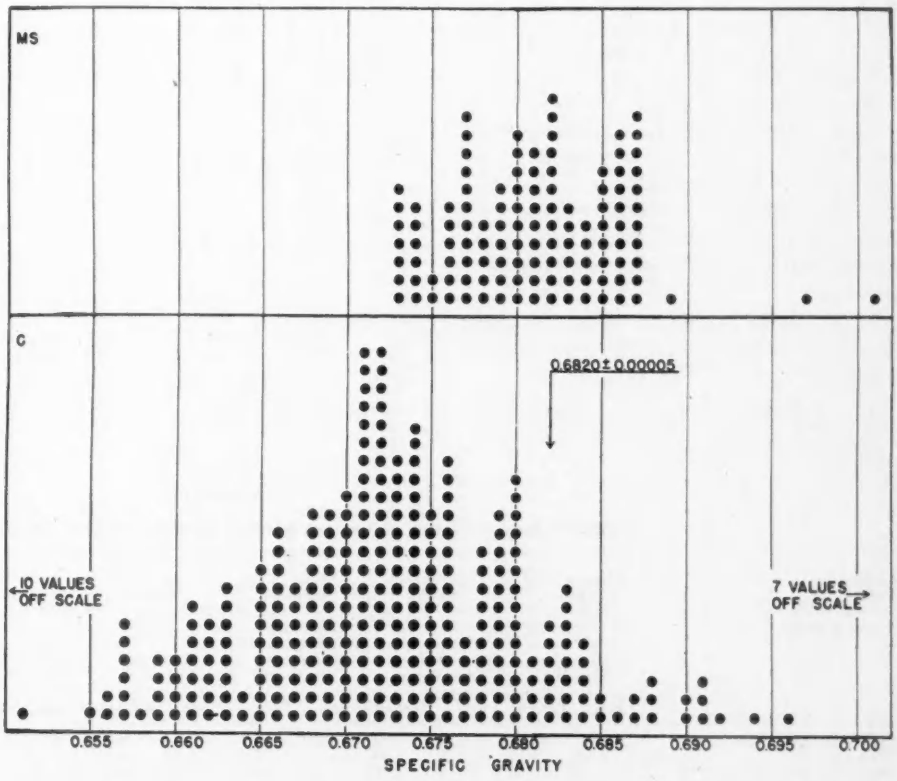

Figure 1. Frequency-distribution plots of data from cooperative analyses of a standard sample of natural gas by the mass spectrometer and established chemical methods reveal at a glance the actual state of gas analysis in this country at the present time. This typical plot illustrates the range of values of specific gravity—only one of several items in a complete analysis—obtained by two of the most important methods of gas analysis. The values in the upper section marked MS were calculated from analyses by the mass spectrometer and those in the lower section, C, from chemical analyses. Every circle represents the specific gravity calculated from one analysis of the standard sample. The abscissas are numerical results derived from the analyses and the ordinates indicate the frequency with which they occur. For example, reading the upper (MS) section, it is seen that seven analyses yielded the value 0.673, six gave 0.674, and so on. The known measured value was 0.6820 ± 0.00005.

Both the mass spectrometer and the conventional volumetric chemical methods have recently been used by a group of cooperating laboratories in the analysis of a standard sample of natural gas. Twenty laboratories possessing a total of 21 spectrometers participated in the spectrometric tests, and 30 laboratories in the chemical tests.

This represents one phase of study of existing methods of gas analysis by means of a nation-wide cooperative analysis of standard samples, which the National Bureau of Standards is making in cooperation with a subcommittee of the American Society for Testing Materials. (These samples are not to be confused with the regular standard samples issued by the Bureau for purchase, but are carefully prepared gas samples

■ CONTINUED ON PAGE 54

FLOOD-WATER TREATMENT

In Eastern Kansas

By CARL L. PATE
Oil Field Research Laboratories

ONE of the most important factors to take into consideration when planning a water-flooding project is a reliable source of desirable water. Practically all waters found in eastern Kansas require some type of treatment before they are satisfactory for injection into an oil-bearing formation. Because of the importance of this phase of operation, this article will deal only with water treatment.

Flood water should be treated in such a way as to meet the following requirements:

1. Eliminate plugging of the pay sand.
2. Will not react with the formation water to precipitate solids in the pay sand.
3. Retard or eliminate corrosion of pressure lines, tubing, etc.

A treated water that will meet the above conditions should relieve the operator of any worry from this phase of operation.

As mentioned above, an abundant supply of water is essential for successful water-flooding operations. Operators in eastern Kansas obtain water from one or a combination of the following sources: (1) Wells; (2) rivers; (3) impounded surface water; (4) return salt water.

The chemical characteristics of various waters used by most of the operators in eastern Kansas are given in Table 1. By observing the data given in this table it is evident that the Mississippi lime formation supplies most of the water used for water repressuring in eastern Kansas. In Greenwood County, however, the Big Salt sand formation furnishes water for most of the water-floods in this area. In order to prevent the contamination of streams by return salt water, it is common practice to mix this brine with the regular source and properly condition the com-

TABLE 1

Chemical Characteristics of Various Waters Used for Water Flooding in Eastern Kansas

Location	Chanute Field		Chanute Field		Selma Pool		Paola Field		Paola Field		Wellsville Field		Rantoul Field		Bush City Field	
County	Neosho		Neosho		Anderson		Miami		Miami		Miami		Franklin		Anderson	
Source of Water	Mississippi Lime Well		Mixture of River and Return Salt Water		Mixture of Mississippi Lime and Return Salt Water		Mississippi Lime Well		Mississippi Lime Well		Mississippi Lime Well		Mississippi Lime Well		Mixture of Mississippi Lime and Return Salt Water	
	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent
Sodium and Potassium	9,060	35.30	21	5.69	6,491	33.37	8,634	30.90	6,792	33.82	10,747	30.95	9,403	32.79	6,465	34.51
Silica	14	0.05	2	0.54	14	0.07	12	0.04	14	0.07	10	0.03	24	0.09	21	0.11
Iron	5	0.02	0	0.00	0	0.00	0.2	0.00	3	0.02	1	0.00	1	0.00	0	0.00
Calcium	512	2.00	70	18.97	594	3.06	1,162	4.16	518	2.58	1,623	4.68	995	3.47	406	2.17
Magnesium	253	0.99	10	2.71	278	1.43	521	1.86	287	1.43	604	1.74	408	1.42	228	1.22
Chlorides	15,354	59.83	35	9.49	11,404	58.62	16,449	58.85	11,909	59.30	19,929	57.41	16,564	57.75	10,961	58.50
Bicrabonates	456	1.78	127	34.42	164	0.84	422	1.51	557	2.77	308	0.89	365	1.27	570	3.04
Sulphates	9	0.03	104	28.18	508	2.61	751	2.68	2	0.01	1,494	4.30	921	3.21	85	0.45
Total Solids	25,663	100.00	369	100.00	19,453	100.00	27,951.2	100.00	20,082	100.00	34,716	100.00	28,681	100.00	18,736	100.00
Carbonate Supersaturation	46		4		10		2		18		0		10		26	
pH	7.7		7.7		7.9		7.0		7.1		7.1		7.3		7.9	
Specific Gravity at 60° F.	1.0196				1.0146		1.0214		1.0162		1.0231		1.0182		1.0138	
REMARKS	Water was aerated to remove sulphides. Not Treated		The water was treated and filtered		The water was treated and filtered		The water contains sulphides in solution		The water contains sulphides in solution		The water contains sulphides in solution		The water contains sulphides in solution		The water contains sulphides in solution	

Location	McCune Field		Elsmore Field		Bolton Field		Hester Pool		Wayside Pool		Greenwood		Seely Pool	
County	Crawford		Allen		Montgomery		Montgomery		Montgomery		County		Greenwood	
Source of Water	Mississippi Lime Well		Aerated Mississippi Lime Water from Pit		Aerated Mississippi Lime Water from Pit		Mixture of well and Return salt water		From Well Depth 252 Ft.		From Well Big Salt Sand		Mixture of well and Return salt water	
	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent	ppm	Percent
Sodium and Potassium	4,164	34.58	1,083	32.52	20,057	30.67	7,841	31.91	13,139	31.78	34,833	32.32	25,519	32.47
Silica	2	0.01	6	0.18	5	0.01	12	0.05	18	0.04	5	0.00	19	0.02
Iron	0	0.00	0	0.00	0	0.00	0	0.00	19	0.04	32	0.03	1	0.00
Barium											85	0.08		
Calcium	201	1.67	74	2.22	3,738	5.72	977	3.98	2,000	4.84	4,523	4.19	3,403	4.33
Magnesium	130	1.08	48	1.44	941	1.44	463	1.88	575	1.39	1,646	1.53	1,069	1.36
Chlorides	6,618	54.96	1,670	50.16	39,413	60.27	15,014	61.10	25,403	61.45	66,555	61.75	48,326	61.49
Bicarbonates	925	7.68	381	11.44	203	0.31	233	0.95	152	0.37	72	0.07	93	0.12
Sulphates	2	0.02	68	2.04	1,037	1.58	33	0.13	36	0.09	29	0.03	166	0.21
Total Solids	12,042	100.00	3,330	100.00	65,394	100.00	24,573	100.00	41,342	100.00	107,780	100.00	78,596	100.00
Carbonate Supersaturation	8		18		12		8		−6		−22		−4	
pH	7.2		7.9		7.5		7.7		7.3		6.9		7.2	
Specific Gravity at 60° F.	1.0090		1.0039		1.0505		1.0180		1.0304		1.0817		1.0572	
REMARKS	The Water is free of sulphides		The Water is free of sulphides		The Water is free of sulphides		Untreated				Water contains free carbon dioxide		The Water was aerated	

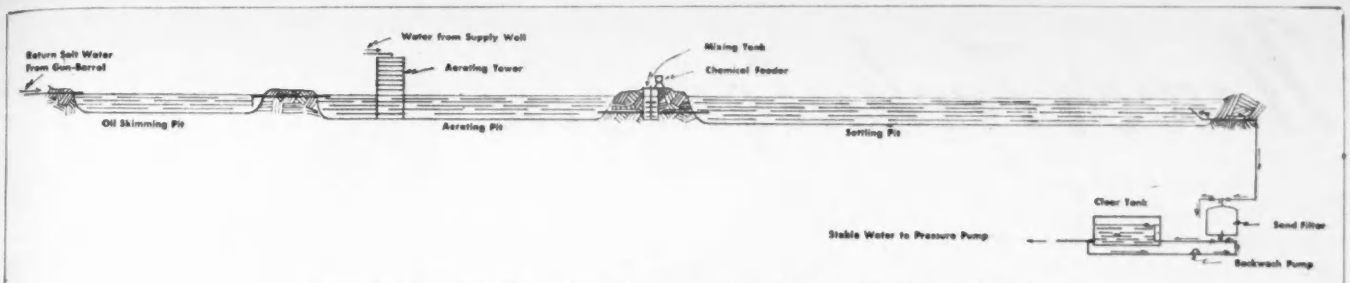

Figure 1. Flow sheet of one type of water-treating plant used in eastern Kansas.

bined waters prior to injection into the pay sand.

Water Treatment

In order to meet the above conditions it is necessary that an effort be made to treat the raw water in such a way that it will be clear, stable, free of suspended and live organic matter and of iron, will not react with the formation water, and will be noncorrosive to treating equipment, pipe, etc.

After the operator has decided on the type of water to be used he should give special attention to the following factors:

1. Representative samples of the water and return salt water should be submitted to a competent water chemist for analysis and recommendations as to the method for treating.
2. The treating plant should be designed to properly condition the water in question.
3. Before mixing return salt water with the raw flood water special precautions should be taken to remove any oil that may be present.
4. The plant operator should be supplied with sufficient chemical apparatus for making water control tests.

From the analysis of the water and the results of jar tests, the chemist can give recommendations as to the most effective and cheapest method of treatment. The undesirable constituents present in most Mississippi lime water are sulfides and carbonate supersaturation (excess bicarbonate). Sulfides are corrosive to pipe, tubing, etc., and will react with any iron that may be present in the formation water to form iron sulfide which would have a tendency to plug the pore space in the sand. When a water is supersaturated with bicarbonate (half-bound carbon dioxide), such as calcium bicarbonate, the water is unstable and as a result part of the bicarbonate breaks down into calcium carbonate, free carbon dioxide and water. In order to condition satisfactorily this water, all of the sulfides should be removed by aeration prior to chemical treatment and sufficient hydrated lime added to the aerated water to reduce the carbonate supersaturation to a value between 0 and 10 parts per million.

The method most operators use for conditioning Mississippi lime water is aeration followed by hydrated lime treatment, sedimentation and filtration. The purpose of aeration is to remove sulfides and part of the free and half-bound carbon dioxide while sufficient lime removes any remaining free carbon dioxide and reduces the carbonate supersaturation. Where the settling pit or tank is not large enough to give ample settling time or it is desired to speed up the settling of suspended solids, filter alum (aluminum sulphate) is added along the lime. During aeration and lime treatment the following reactions take place.

1. $Ca(HCO_3)_2 + \text{Aeration} \longrightarrow CaCO_3\downarrow + CO_2\uparrow + H_2O$
   Calcium Bicarbonate + Aeration → Calcium Carbonate + Carbon Dioxide + Water
2. $Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2CaCO_3\downarrow + 2H_2O$
   Calcium Bicarbonate + Lime → Calcium Carbonate + Water
3. $CO_2 + Ca(OH)_2 \longrightarrow CaCO_3\downarrow + H_2O$
   Carbon Dioxide + Lime → Calcium Carbonate + Water

Part of the sulfides present in the water pass off into the air as hydrogen sulfide and part are oxidized to free sulfur. Some chemists believe the sulfides are present in the water as calcium oxysulfide. If the presence of live organic matter shows up in the pits, it will be necessary to use an algicide such as chloramine, copper sulfate or cuprose in order to destroy same.

The undesirable constituents present in the Big Salt Sand water are iron and free carbon dioxide. Where this water is chemically treated it is common practice to mix this and the return salt water and subject the mixture to aeration in order to remove most of the iron and free carbon dioxide followed by lime treatment, sedimentation and filtration. The hydrated lime serves to remove the remaining iron and free carbon dioxide and increase the pH value of the water. During aeration part of the iron is oxidized to iron hydrate and part remains in solution, probably because of the presence of carbonic acid.

In the treatment of surface water, such as river or impounded surface water, it is necessary to remove suspended solids and live organic matter. In most cases this is accomplished by treatment with hydrated lime, filter alum (aluminum sulfate) and an algicide followed by sedimentation and filtration.

• CONTINUED ON PAGE 54

TABLE 2

Approximate Chemical Costs for Treating Various Waters

Treatment No.	Source of Water	Volume of Water Treated per 24 Hours, Barrels	Chemicals Used	Average Dosage, Lbs./100 Barrels	Approx. Chemical Cost per 100 Barrels
1	Mississippi lime and return water	1,000	Lime H.T.H.	5.00 0.10	$0.068
2	River and return water	5,500	Lime Alum	1.50 1.80	$0.047
3	Return water	6,000	Lime Alum $CuSO_4$	1.10 0.93 0.067	$0.034
4	Well and return water	1,800	Lime Alum	2.78 1.10	$0.044
5	Mississippi lime and return water	3,100	Lime	4.84	$0.039
6	Surface and return water	4,500	Lime Alum H.T.H.	1.11 0.67 0.03	$0.030

NOTE—H.T.H.—Calcium hypochlorite. $CuSO_4$—Copper sulphate.

Newer Techniques in AERIAL SURVEYING

Part 2

The Photographic Laboratory

By DR. SHERMAN A. WENGERD,
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EXIGENCIES resulting from operations under adverse conditions during wartime have led to development of many new photographic laboratory procedures. New equipment readily adaptable to peacetime operations has been developed for rapid operations under rigorous conditions (39, Ask-1944).

Three new types of laboratories which have been developed and found suitable for operations under peculiar climatic conditions are: the mobile photographic trailer; the Army Air Forces portable photographic laboratory; and the Quonset or Pacific Hut air-conditioned laboratory.

The photographic trailer, mounted on heavy-duty tires, has seen wide duty on Naval bases in the Pacific area. The unit is self-contained with large developing tanks, the latest safe lights, automatic printers, washers, dryers, and film-labelling devices. The Army Air Forces portable laboratory is built of lightweight, chemically-treated, light-proof canvas walls, partitions, and washing tanks which can be folded up in small space for transport by air to outlying bases.

These laboratories have undergone rigorous tests under Arctic and tropic conditions by photographic units attached to the Air Transport Command. These field laboratories for developing negatives and processing of check prints to determine photographic coverage may be applied by commercial contractors working long distances from established base laboratories. The air-conditioned Pacific Hut was designed by the Bureau of Aeronautics of the Navy Department as a complete knockdown laboratory with washers, dryers, developing tanks, refrigeration units, storage spaces, work tables, and film inspection tables for use at established Pacific and northern bases where aerial photographic processing and initial photographic interpretation could be done. Storage of photographic film prior to and after exposure was best done at controlled humidity varying from 40 to 60 percent and temperatures below 60° F. Vapor-tight packages were developed for film as protection against excess moisture and harmful gases (41 Noble—1940).

The speed with which aerial photography had to be completed and laboratory work done under front-line conditions necessitated the use of many automatic devices which have proved effective in the handling of large quantities of film and photographic paper under precise light, temperature, and time controls. A lightweight portable developing outfit for roll aerial film was designed with small floating-power electrical motors that wind and rewind film negatives through developing and fixing solutions automatically. Changes of solutions allowed adaptation of the developing outfit as a washer which finished a standard roll of aerial film with a minimum of manual handling. Rolls of continuous-strip prints were also developed, fixed and washed in the machine. Hand drying of film on large wooden-slat drums has been outmoded by a portable film drier which handles negative and positive materials at a speed of ten feet per minute.

Continuous Printer

The continuous printer has proved one of the greatest advances yet made over difficult and laborious hand printing. Using a special type of low-shrink paper, this machine can print aerial negatives in 200-foot rolls at a rate of 40 feet per minute. Well-exposed aerial negatives can be strip-printed quickly and exposures regulated easily by rheostats during the printing operation. Design of photo-electric cell automatic-exposure control for this printer is feasible and desirable for a minimum of reprinting on negatives covering terrain where light from the subject varies greatly. The hand-operated Abrams and Fairchild contact printers, though slow in individual handling of each negative on roll film mounted on spools at the side of the printer, have been improved to a point where exposure control of difficult negatives is facilitated by lights controlled through bank switches. Negative inspection machines have been devised for rapid editing of aerial negatives, but the handling of film in this phase of operation cannot be speeded beyond human capacity to check film for fog, density, contract, focus, and ground coverage.

The handling of aerial negatives after drying must be facilitated by some means of individual identification. Data often placed on negatives include project designation, flight line number, exposure number, focal length, flight altitude, date, time, camera number, and sortie number. These data generally appear on the leading or trailing edge of the negative. Hand-stamping of much aerial film is very tiring, slow, and inaccurate. Stamping machines with automatic numbering and lettering tumblers have been designed using quick-drying ink which will allow stamping of the negatives as rapidly as the film is inspected. The

Photographic Science Laboratory, Bureau of Aeronautics, U. S. Navy, has devised a system whereby these data are lettered on cellophane strips and inserted in the printer. Automatic or hand-stamping of exposure numbers must be done to fill out the data line because the exposure number changes with each negative examined.

Checking flight coverages, an engineering phase of negative inspection, is generally done by template plotting of every third negative on flight maps to determine if complete photogrammetric coverage was gained on a flight project. This technique, though inexpensive, is commensurately inaccurate where good flight maps are not available.

A second tedious but more accurate method is the layout of each print for check of side-lap and fore-lap, covering the whole area and resulting in an uncontrolled mosaic. It is at this point in the photographic process that use of the stapled-down prints as a map is dangerous for those uninitiated in the use of photographic coverages in the field. Though the uncontrolled stapled-down masoic is accurate enough as a re-flight map, use of this uncontrolled mosaic for geologic exploration is fraught with danger in detailed work.

A system of flight checking was developed in the Pacific which was both accurate and speedy. Rolls of 9x9-inch negatives were printed on continuous-strip printers, resulting in whole flight strips which could be laid down side by side on long tables. Side-lap was checked directly by matching images common to both flight strips, whereas fore-lap was checked by laying a percentage-divided acetate template over each print. Experienced flight checkers soon learned to come within 2 percent of true fore-lap by estimation. Whole atoll areas thus could be laid out and checked by eye directly, an obvious advantage over hand template plotting of flight coverage on inaccurate charts. After final checking of all aerial prints with rejections labelled and plotted for reflight, the negatives are temporarily numbered. Final check prints are carefully laid by matching images and a mosaic is stapled to composition board. If extensive reflights are necessary to fill blank areas ("holidays"), new flight lines are drawn in white or black ink on the matched mosaic, the board is copied, and pilots furnished mosaic flight maps. Over areas difficult to fly, this procedure was found to be an accurate means of gaining final precise coverage.

Upon completion of a project, all negatives are numbered in serial succession as the Army Air Forces does, or different sorties serially numbered. A final set of check prints is then made and laid into a matched mosaic in such a manner that the data line on each photograph appears for the observer. The mosaic is copied as a photo-index and supplied to the user of the project photographs over the area to be explored.

Field Control Methods

Despite all our photogrammetric techniques, we still must depend upon ground measurements for control of photographs in precise photogrammetry. A discussion of late methods of ground control in relation to new aerial techniques, however, will show how control for mapping has become somewhat more independent of toilsome bush-whacking methods formerly used in building a map "from the ground up."

Ground Surveys: Ground surveying for the control of aerial photographs can be done prior to, during, or subsequent to the photographic coverage. Civilian commercial projects can be planned so that all ground control points are marked in the field prior to photography for easy identification on the photographs. In military coverages, speed was essential and prior planning sometimes impossible, hence photographs often were flown long before ground control could be obtained. This situation made available to the ground surveyor aerial photographs upon which he could plan his triangulation net, facilitate easy routing of survey parties, and finally spot his control points.

The worst condition was found to be one in which an area had to be surveyed and photographed at the same time, thus making both operations independent of each other. Later spotting of control often was erroneous in the office because the photographs were not available to the ground surveyor before they, with the control notes, were turned over to the photogrammetric engineer. The solution to this tieup is to make the maps very slowly by the old ground survey methods, or to make them entirely by photogrammetric methods. The former is slow and results in too little detail. The latter is inaccurate over wide areas, but results in accurate portrayal of minute detail.

An engineering solution to that problem is the invention of instruments and development of techniques whereby a minimum of ground control can be applied to accurate photogrammetric compilation of maps, or further development of aerial triangulation methods which would divorce photogrammetric compilation completely from the ground control methods. This section will show that the latter course has not yet been attained and also will describe some late changes in ground surveying which make ground control rapid enough for precise photographic mapping.

Astronomical observations for latitude and longitude of an initial point are necessary in unmapped areas. Formerly, when ground methods were used exclusively in making maps, it was not uncommon for an astronomical party to spend from two to six weeks getting an accurate latitude and longitude from stellar and solar observations with the zenith telescope or the meridian transit. Complex computations with numerous instrumental and atmospheric corrections based on average tables were then made, to arrive at final latitude and longitude of the observation point. Invention of the French 60-degree astrolabe reduced computation to a minimum, and accurate observations for latitude and longitude could be gained in two clear nights. The instrument, though ponderous, is portable and requires a cement shaft to bed rock to gain stability necessary for precise observations (45, Samuels—1943).

Two late developments by the Army Air Forces to do the same job almost as accurately and with greater speed are the equiangulator and the zenith camera. The equiangulator, an adaptation of the astrolabe, is a 60-degree instrument shooting only stars that have a vertical angle of 60 degrees at any computed instant. Over a period of one night's observation, many stars are observed as they pass the 60-degree vertical angle. A polished aluminum plate leveled by plumb bob provides optical conjunction of the directly-observed 60-degree star and the reflected image of the same star. This technique is also used in the French astrolabe but a well of mercury provides the reflected image of the star. The zenith camera, a precise instrument for photographing the night sky, gets a photographic image of stars at computed intervals. Latitude and longitude are then gained by computation of accurate measurements of star points recorded on acetate film base. Accurate time must be had for a good astronomical position.

The invention of precise chronographs with time interval recorded on paper has speeded up and made more accurate the making of latitude and longitude observations. The equiangulator and zenith camera are new instruments for furthering more rapidly an old observation technique. Their portability and accuracy improve greatly the results of an old observational technique.

Further Development

A further development, which may soon be announced as entirely successful, may divorce latitude and longitude observations from ground occupation of astronomic stations. As soon as a method is devised of holding the zenith camera continuously vertical in an airplane, it will be possible to take a flare-exposed vertical aerial photograph at

night simultaneously with a zenith exposure of the heavens. Simultaneous photography of such "air control stations" approximately 30 miles apart will provide adequate control for photogrammetric triangulation of an area covered by trimetrogon photographs or, with greater refinement and additional points, may prove to be adequate for map compilation of vertical aerial photographs.

Two recent methods of ground surveying for compilation control are based on the use of balloons and flare triangulation. Helium-filled balloons, sent up over pre-chosen spots on aerial photographs, are brought directly over the control point by three guy lines and checked with a vertical collimator mounted on a tripod. By radio communications, simultaneous observations of the balloon are made from three located points. Vertical and horizontal angles shot with transits give both triangulation control and extension of vertical control by trigonometric leveling (44, Littleton—1941). Flare triangulation employs the same surveying technique and is done at night but has not been found as accurate for vertical control extension. It has been found that balloon triangulation is equally as accurate, only 60 percent as costly, and twice as speedy as third order traverse.

As far as this writer knows, few new techniques were evolved during the war in precise triangulation, plane-table triangulation, transit traverse, and spirit leveling. Older techniques of ground mapping, though used in gaining precise control, were too slow for mapping wide areas in a short time.

A new traversing technique, developed by the Army for use in reconnaissance jeeps, proved of good use where great accuracy was not necessary. The M-1 Land Odograph, with which the writer has had acquaintance in its conversion to the air-borne odograph, is an instrument in which are set compass direction and ground speed.

Two spiral drives, one activated by compass direction and the other by distance covered, guide a pencil mounted on a freely-traversing drawing arm. The instrument can be set for specific scales varying from 1:20,000 to 1:1 million and will trace the planimetric course of the vehicle carrying it. Its use in the control of aerial photographs is yet dubious because it has not been adapted with precise altimetry to record a profile which can be used to correct the horizontal trace. It is believed that additional refinements in the odograph will warrant its use in the oil industry as a means of mapping low-relief terrain. A combination of precise altimetry with the odograph may prove a simple method of doing reconnaissance geological mapping in areas similar to the Near East after preliminary geological interpretation of geological photographs is completed. Aerial traversing certainly warrants further study as a means of control for aerial photographs.

A new system of radar triangulation called Shoran, recently has been released for civilian use. Two intervisible Shoran stations some miles apart at the ends of a measured base line enable a ground vehicle above the visible horizon (within sight of the base stations) to be located to an astounding accuracy during ground mapping. This special radar technique applied from two widely-separated stations whose latitude-longitude positions are known may greatly speed up control coverage of an area by supplying "fixes" for the control of odograph traverse traces made in ground vehicles.

Precise altimetry in ground surveying has only recently taken its place as an accurate method of gaining control elevations. A research project by Dr. Philip Kissam of Princeton University has placed the precise aneroid altimeter definitely into the accurate class as a possible replacement for plane-table elevations and trigonometric leveling (43, Kissam-1945). Highly sensitive altimeters have been developed by several firms. Recent research by Kissam has resulted in a two-base method of precise altimetry in which it is not necessary to apply generalized (hense locally inaccurate) correction factors for temperature, relative humidity, latitude, and altitude. The vertical column of air over the area to be surveyed is calibrated with respect to density by reading base altimeters at regular intervals located at the vertical extremities of the area. The method is precise but somewhat limited in regional applications at the present time.

In earlier tests of this method the area to be surveyed had to be less than 20 square miles, wind velocity not to exceed ten miles per hour, the vertical extremity base altimeters within ten miles of each other and not over 200 to 300 feet apart vertically. Adherence to these conditions gave guaranteed average accuracy of two feet for the elevation of points measured within the area. In later tests, the altimeters were placed 2000 feet apart vertically while the surveying altimeter was used in measuring points. An average vertical error of five feet resulted. Tests made in the latter part of 1945 on a controlled survey utilized the two-base method for establishing the elevations of five points between two bases 45 miles apart having an elevation difference of 4000 feet. Maximum vertical error was 6.3 feet and average error for all five points was only 2.7 feet. It is noteworthy that this is far greater precision than has ever been attained with previous aneroid methods. Extension of the area which can be covered with the two-base setup will no doubt be devised.

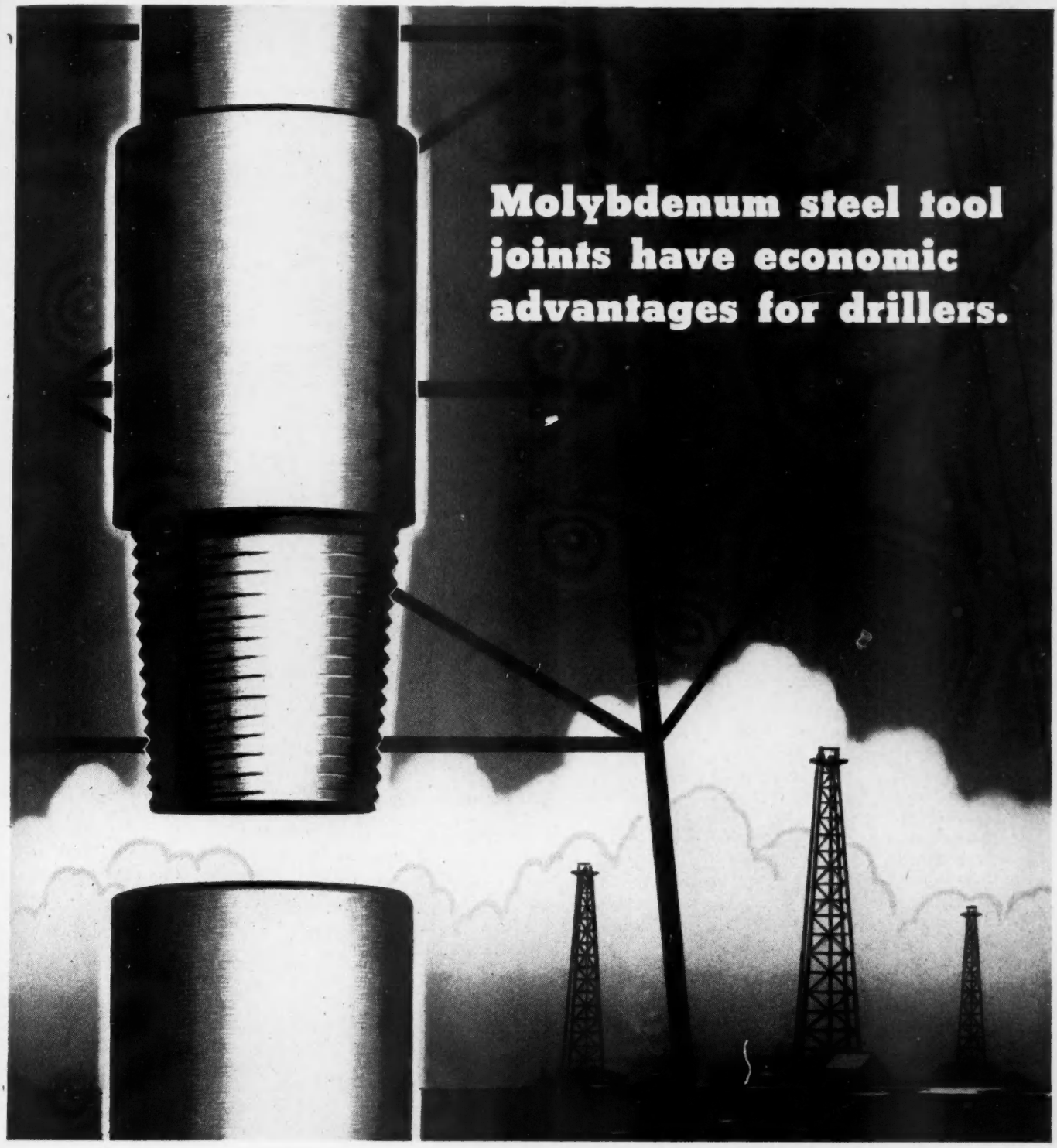
Contour mapping by photogrammetric means will be greatly facilitated with the precise vertical control which can be obtained by this inexpensive method of obtaining elevations.

Control from the air: Though ground control will always be necessary for certain land survey operations, the writer foresees increasingly more transfer from ground techniques to aerial techniques for gaining ground control. Progress is effected only where strenuous effort is made. Some of these late strenuous efforts will be described.

The horizon oblique photograph has been applied lately to control operations using techniques developed by R. M. Wilson, O. M. Miller, and Alexander Forbes. A good oblique photograph of known altitude and showing a good horizon yields a wealth of control data when handled graphically or with special instruments (90 Wengerd—1945). The aerial surveyor can do without ground control in constructing a simple shore-line map or cultural feature map of terrain having low relief, but unless two aerial photographs are taken of the same area in such a manner that their plumb points (location of the airplane at the instant of exposure) are known and plottable on an existing map, no accurate planimetry can be plotted in areas of appreciable relief. Only with several elevation control points identifiable on the oblique can a topographic map be made of the area covered by the bottom half of an oblique photograph.

The dependence of the oblique photograph on ground control for its orientation in space is thus evident. If this minimum of control is available, the oblique photograph can provide excellent control for points which fall on one datum (i.e., sea level points). Two aerial obliques, deliberately shot to show measured base stations and one other triangulation expansion point whose elevations are known, or three triangulation points whose elevations are known, make these photographs amenable to graphic solutions for additional triangulation points and elevations (85 Landen—1945). These added points may then be used to control vertical photography at a vast saving of the money which might be spent in expanding the control by ground surveying.

Two instrumental means developed prior to the war have found wide use by the American Geographical Society and the U. S. Geological Survey. The Wilson Photoalidade was developed by R. M. Wilson for use in reconnaissance topographic contouring by the Alaskan Branch, USGS (91 Wilson—1937). The instrument has been adapted for location of extended control points, plus elevation determination of points, by



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utilization of depression angles of selected points below the horizon. The Miller Single-Eyepiece Plotter, developed by O. M. Miller at the American Geographical Society, was devised as a result of high-relief-terrain mapping in northern Labrador (86 Miller—1938). This simple instrument did not receive the wide wartime applications it should have had for the type of work it does. It is thought to be an excellent means of control extension over virgin terrain and for the plotting of reconnaissance maps for precise flight photography and ground reconnaissance. Data on variations in the cost and speed with which mapping can be done or control extended are not available. No commercial company has seriously applied these aids to oil exploration over a long period of time in different types of terrain.

Controlled flying is based on careful planning with maps now in existence as guides to gaining vertical and oblique photographic coverage. The flight map with computed flight lines drawn on it is the best known system for obtaining precise coverage. The Solar Navigator has been suggested as a means of establishing triangulation of an approximate nature. It was developed by Leon T. Eliel for use over tropical terrain which had never been mapped (22 Eliel—1937). This instrument, mounted in the plane, supplies a continuous true north reading by means of a sun compass. The pilot is charged with keeping the plane on an even keel laterally, whereas the photographer is responsible for keeping the Solar Navigator leveled longitudinally. Sunlight is directed by mirrors into a lens which in turn focuses a thin pencil of light on two photo-electric cells. When the compass points north no sunlight falls on the cells, but the slightest azimuthal deviation of the plane causes the sunlight to fall on one of the cells which in turn activates the galvanometer on the pilot's instrument panel. The pilot is thus immediately warned when his line of flight is off true heading, and he corrects his flight course. Flight lines are corrected for drift by viewing the terrain through a gyroscopically-leveled view-finder.

Flights begun with the Solar Navigator over points whose locations are known my be extended into uncontrolled territory of rough mountains and jungles. Other flights begun over known points are flown into the first flight at an appreciable angle. By criss-crossing an inaccessible area, a triangulation net can be set up which, though crude, will serve many of the purposes to which the photogrammetric maps may be put.

The above-mentioned map and navigational aids to flying are used to do the manual job of flying the photographs.

By what means can extensions of these and newer techniques be used to control the aerial photographs during compilation into maps? Several techniques have been tried with varying success. The Aerial Survey and Mapping Unit of the U. S. Navy made serious efforts, in the Pacific area, to fly deduced-reckoning courses with magnetic flux-gate compass and controlled air speed. By keeping accurate notes, the pilot was to record each change of heading and the exact time of change. Oblique photographs were to be shot at a pre-computed interval of 20 seconds for an air speed of 150 knots. Prior to the controlled flight, a wind direction diagram was constructed by flights in three directions and use of the leveled view finder to check drift.

A whole island was obliquely photographed in this manner and the track was plotted as a closed course of flight ending as nearly as possible over the point of origin of the photographic traverse. After the flight was completed and photographs printed, an oblique-coverage template was constructed. An accurate U. S. Geological Survey topographic map of the island was then used to plot by resection the position of the airplane at each camera air station. A comparison of preflight plotted courses on the map which the pilot was to follow, with courses plotted by dead reckoning and air speed, and the finally plotted positions of the airplane at each exposure station, proved that controlled flying without more instrumental aids fixed on the ground, for the purpose of controlling photographs in final map compilations, was not an accurate procedure. Oblique photographs alone could not be expected, therefore, to control vertical photographs without application of precise oblique photogrammetry.

Alaskan Experience

Exploration of Naval Petroleum Reserve No. 4, an almost completely unmapped 35,000-square-mile block on the Arctic slope of Alaska, was carried forward with every means known to exploratory science. Among these techniques was the use of an air-borne AO3 odograph, adapted for tracing the flight courses of a PBY5A used in magnetometric flying. Due to the lack of an experienced operator and development of mechanical difficulties thousands of miles from a precision laboratory, the air odograph was not fully tested. It cannot be doubted that the oil industry, if sufficiently interested in controlling reconnaissance photography without ground surveying, could develop this instrument for more precise work.

Invention of the radio altimeter has provided a terrain clearance indicator of remarkable accuracy ([35]Espenschied and Newhouse—1939). Application of continuous precision altimetry of rough terrain from the air has been made by the U.S.C & G.S. and the Army Air Forces in a new method not as yet fully tested over control areas. Two accurate aneroid altimeters continually checked with ground aneroids at the extremities of the area traversed are compared at regular intervals with the radio altimeter as the plane flies along. The differences of elevation recorded by the brace of aneroids and the radio altimeter in the plane is a measure of topographic relief over which the plane flies. Closed traverses are flown to check back over the base elevation from which the flights originate, and courses are planned which take the airplane over points of known elevation for running checks of the equipment. Correction for temperature and instrumental drift are of course applied.

This technique, now in its crude stages, will no doubt be refined for vertical control of aerial photographs in compilation of Multiplex or Stereoplotter topographic maps as soon as some company interested in inexpensive vertical control is required to map a large area with a minimum of ground control.

Shoran involving special radar equipment has been tested for accurate location of a plane in space during photographic flying. These tests, made in regular photographic flights, have proved that the two-point Shoran fix will limit the amount of ground triangulation needed in photogrammetric map compilations. Astronomical observations or ground control will still be necessary for locating the Shoran towers. Inasmuch as Shoran does not operate beyond the horizon, beacons on towers will extend the range of location ability. Synchronous photography and Shoran fixes may well prove the future method of fully-controlled precise aerial photographic surveying.

The projected use of helicopters for control extension and triangulation from the air may develop into a combined control-photographic technique. Measurement of a base line on the ground with primary expansion to a polygonal net of triangulation stations may lead to employment of hovering aircraft over each end of a long base line or at the corners of the polygonal triangulation net for complete 360-degree coverage of the area with horizon obliques.

It is not far-fetched, in view of the progress recently made in aerial photogrammetry, to believe that the continuous-strip camera soon may be adapted as a panoramic camera and mounted on a gyro-stabilized rotating base suspended in or below a helicopter to gain coverage from the plumb point of the aircraft to the horizon through a full 360-degree arc. A gyroscopically stabilized sight would need to be developed to aid in keeping the aircraft continuously over

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the control tower serving as the aircraft's plumb point. Adaptation of this type of photograph to photogrammetric compilation would require the development of a special short-focus alidade-transit (similar to the photoalidade) at which the operator sits surrounded by a completely circular photograph correctly oriented in space. Cutting angles with the alidade-transit then could be done directly and to distances on the photograph directly dependent upon the altitude of the helicopter and the quality of the photograph. Four such photographs over four control points upon high towers at least 50 miles apart would encompass an internally-controlled area of 2500 square miles and a band of externally-controlled area at least 25 miles wide all around the 2500-square-mile block.

Needless to say, these circular photographs would need to be taken from a high altitude with a short focus lens. Many mechanical difficulties make such an idea hopeless and impractical of attainment at the present time but development of such a technique may prove a means of saving thousands of dollars worth of laborious ground surveying.

A recently announced but untested method of aerial triangulation presents interesting possibilities (#Drummond—1944). An aircraft with a three-camera mount tows a glider with three camera mounts. One camera of the towing craft shoots straight down, a second obliquely to the rear, and the third horizontally toward the glider. The cameras in the glider shoot horizontally forward, obliquely forward, and straight down. Length of the tow line, a continuously present base line, provides the control distance for triangulation computations. The aerial tri-camera mounts are to be gyroscopically controlled in both aircraft, thus giving the plumb point of each craft as the principal point of each vertical picture. Having cameras mounted in mounts at a known angle to each other, it is possible to compute ground scale, vertical height, and topographic relief by successive solution of triangles. Radio communication or electrical impulse via the tow cable can be used to trip all six camera shutters simultaneously. Application of this technique has not yet been made, partly because gyroscopic stabilization of cameras has not been entirely successful; but the probability is that it could be used over difficult terrain after some further research to determine its practical applications. Use of this technique by the oil industry probably will be limited to arctic and tropical terrain where few maps are available for control of aerial photography.

Flood-Water Treatment

• CONTINUED FROM PAGE 45

The success in the treatment of the water depends, to a great extent, on the design of the water-treating plant. Proper agitation, detention time, baffle arrangement, feeding of chemicals, and filter capacity are important items which the operator should take into consideration when designing his plant. In practically all recent installations for the treatment of water, especially Mississippi lime water, earthern pits are replacing tanks as they give much more detention time and are cheaper. A flow sheet of a typical plant of this design is given in Figure 1. Plants of this type are giving very satisfactory service. In a system of this type the return salt water flows by gravity from the gunbarrel to the oil skimming pit where the last trace of oil is removed. From here it flows into the aerating pit where it mixes with the aerated water, then the combined waters pass through the mixing tank into a large settling pit. As the water flows through the mixing tank, chemical is added by means of a dry chemical feeder, and thoroughly mixed with the water by mechanical agitation. Most of the products of reaction settle out of the water in the settling pit. The water then flows through the filter into the clear tank where it is picked up by the pressure pump and discharged through the pressure lines into the input wells. If possible, the pits are arranged so the water will flow by gravity through them and the filter into the clear tank.

Most of the operators in Greenwood County are using the so-called "closed system;" that is, the water is pumped directly from the water supply well, by large pumping units, directly through the pressure lines to the input wells. Those who use this system hope to keep the water stable by preventing very little, if any, air from coming in contact with the water. There is a possibility, however, that changes in temperature and pressure may upset the chemical equilibrium of the water thereby causing the liberation of carbon dioxide and the precipitation of some dissolved solids.

Chemical Treating Costs

Chemical treating costs vary according to the chemical characteristics of the water, the chemical or combination of chemicals being used, design of the treating plant and bulk purchase of chemicals. Table 2 gives data showing the combination of chemicals used and the approximate chemical costs for conditioning various types of water. The average of the chemical cost, of values given in this table, is $0.0437 per 100 barrels of water.

The Mass Spectrometer

• CONTINUED FROM PAGE 43

furnished to cooperating laboratories.) Reports of this cooperative analysis give for the first time a picture of the actual state of gas analysis in this country with respect to two of the three most important methods of analysis, the third method being fractional distillation.

All analytical data, together with the average values derived from each series of analyses, have been translated from extensive tabular form to a set of frequency-distribution tests which reveal at a glance the entire story both in general and in essential detail. Each circle appearing on the frequency-distribution plots represents a value derived from a single analysis. The circles are plotted equidistant on the ordinate corresponding to their value. Thus the abscissas are values derived from the analyses, and the ordinates indicate the frequency with which these values occur. This manner of plotting shows clearly the distribution of all the results and forms a basis of a probability curve, of which the maxima are the most probable values. These graphical pictures not only save hours of study of the tabulated data, but actually make the significance of the data so self-evident that lengthy and detailed explanation of each plot is unnecessary.

Standardization Need

In general the results are scattered considerably more than had been expected. The lack of reproducibility between laboratories clearly demonstrates for the first time the real need for standardization of analytical methods and procedure in the field of gas analysis. Although the spectrometric values show better reproductivity and closer agreement with the known composition than do the chemical values, further improvement is believed possible. As the method is new and has not yet been subject to great variations of apparatus and procedure, efforts are being made to establish a standard procedure that will lead to even better results with the mass spectrometer.

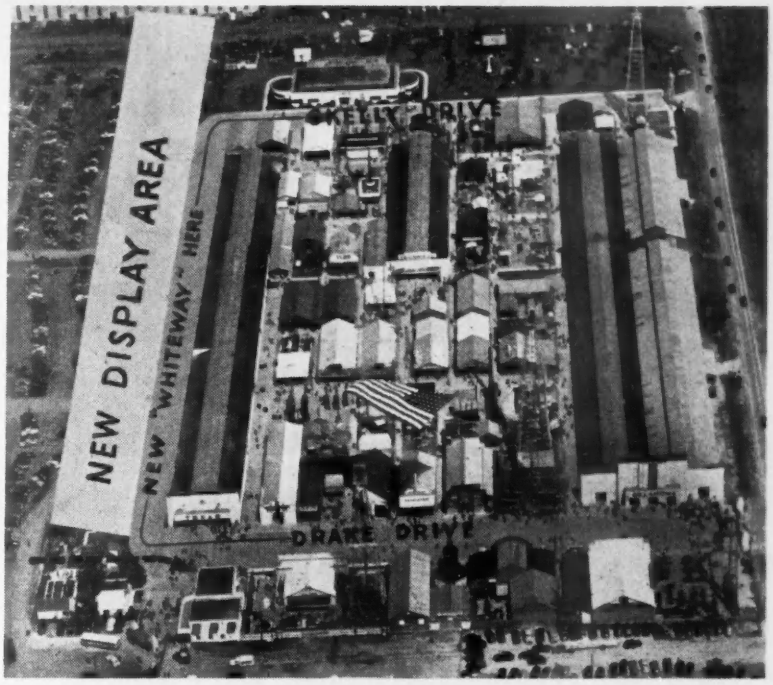
REFERENCE

Martin Shepherd, Analysis of a Standard Sample of Natural Gas by Laboratories Cooperating with the American Society for Testing Materials, J. Research NBS 38, 19 (1947) RP 1759; Martin Shepherd, Cooperative Analysis of a Standard Sample of Natural Gas with the Mass Spectrometer, J. Research, NBS. 38, 491 (1947) RP 1789.

Shell Gives Seismograph

A seismograph has been given to Stanford University by Shell Oil Company, it was announced by Vice President Alvin C. Eurich. The equipment, valued at $12,000 to $13,000, will be used in the school of Mineral Sciences for classroom demonstrations.

Petroleum Exposition Officials Stressing Five-Point Program



Many new exhibitor-owned buildings along a new and brilliantly lighted "whiteway" will house displays at the 1948 exposition. Bethlehem Supply Company, General Motors Corporation and Dresser Industries will erect structures in the newly added display areas to the left. Arrow points to a new and larger headquarters for delegates from abroad which also will be headquarters for Nomads. Smaller white building below arrow is a new four-room hospital.

AN IMPRESSIVE five-point program for the resumption of the International Petroleum Exposition and Congress in Tulsa, May 15-22, 1948, is being put into effect, according to W. G. Skelly, president.

The five points in the planned program stressed by Skelly: Housing of delegates and visitors, special services for individuals or groups attending the show, expanded plant and grounds, plans to stimulate world-wide attendance, and outstanding scientific and technical presentations.

"Housing, hotel and room accommodations for delegates, visitors, exhibitors, their associates and employes is our No. 1 problem, and we've already set up an official IPE Housing Bureau with its own office and its own staff of employes at 821 Wright Building in Tulsa," Skelly explained.

"Every hotel room in Tulsa and nearby cities, all first class apartments, tourist courts, rooms in the better homes will be assigned by the IPE Housing Bureau. Our chairmen, Messrs. Ledterman and Brann, have handled housing for national conventions in Chicago, Detroit, Tulsa. They will distribute them in a fair and equitable manner. Oil people who come to our 1948 show are going to know where their rooms will be located, just what they'll cost and they'll have a confirmed reservation. None of us are going to have all the rooms we want, but our exhibitors are behind us on this share and share alike plan. Advance surveys indicate we'll do a better job on this vital phase of the exposition than ever before."

Special Services

Special services for those who attend the show will prove a boon to delegates and visitors regardless of their classification in the oil industry. A new and enlarged home for the Nomads has been completed on the exposition grounds. Nomads will also have downtown hotel offices to facilitate their many services for oil personnel from abroad. More than 100 highly specialized committees are already organizing programs to have downtown and exposition headquarters with trained service employes who speak the specialist's language and understand his needs and problems. All such services will be free, of course. Before such visitors or delegates leave home to attend the exposition they'll have detailed data on just where and how they can obtain information from their particular group in the industry.

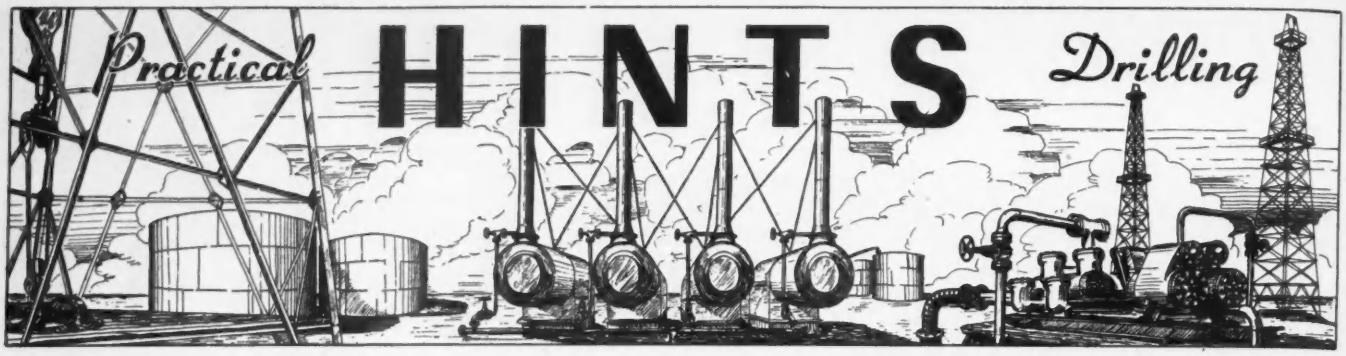
Contractors are well ahead of schedule on a $100,000 plant and grounds expansion program that adds three acres to the north side of the grounds, doubles the feeding capacity of the cafeteria, gives the exposition a four-room hospital, almost a mile of new paving and new sidewalks. The five big exposition-owned structures, similar in size and style to the Texas Building, are being completely renovated and redecorated. Despite these enlargements and improvements a waiting list of more than 150 exhibitors, who have not yet been accommodated on display space, indicates still further expansions and enlargements will have to be made before 1948.

"Such an early and unprecedented sell-out on display space has not delayed the most extensive advertising and attendance building campaign we've ever authorized," Skelly said. "As usual, much of our promotional budget will be invested in full pages in the major oil trade papers. But we now have one of our directors in South America, another special representative soon leaves for a five-month journey in our behalf. More than 1000 Nomads are already inviting their clients and prospective customers to the exposition. Millions of specialized promotional leaflets, brochures and other types of exposition literature, are already at work. We have assurance it will be distributed, by the finest industrials in the world, our exhibitors. Many such promotional pieces will be translated and circulated abroad to arouse interest in every country."

Directory Plans

Skelly also explained that the official directory of exhibitors would be printed earlier and distributed on more extensive basis than ever before. There will be 800 to 1000 manufacturing and service corporations listed in the book, he said.

Plans for a conference to perfect ways and means of holding the World Petroleum Congress in conjunction with the 1950 exposition will have an important place on the agenda of the scientific and technical committee at the 1948 show, according to W. B. Way, general manager. A top-flight scientist and former chairman of the IPE scientific and technical committee has already made preliminary investigations abroad and followed through in Washington. The last WPC was held in Paris, June 14-19, 1937. Way also reported Dr. Benjamin B. Weatherby, M.A., B.A., Ph.D., has agreed to serve as chairman of the scientific and technical committee for the 25th anniversary exposition. Weatherby, vice president and director of Amerada Petroleum Corporation, Tulsa, is internationally known for his scientific achievements. No previous IPE Hall of Science will even approach, in scope, the importance or magnitude of the displays, exhibits, features and presentations planned for 1948, officials believe. A complete cross-section of the latest developments in every branch of the petroleum industry will be on parade, by the industry, for the industry, when the 1948 exposition is opened May 15.



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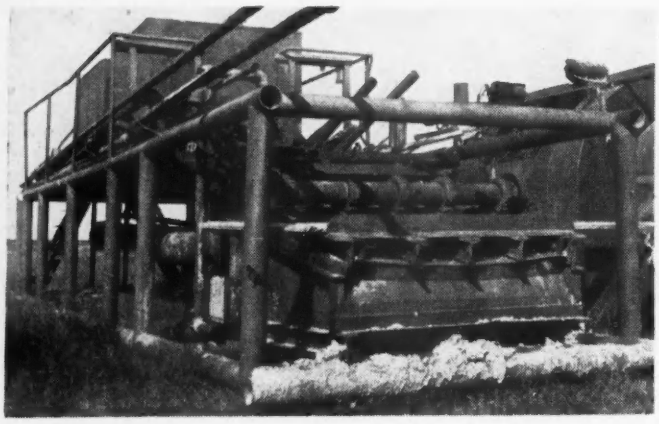
How To— Utilize Mud Treating Equipment for Ease in Transportation



In order to facilitate installation, transportation and dismantling the rig, one contractor mounted the mud lines, shale shaker and chemical tanks on one unitized frame. The box-like structure is fabricated from four-inch pipe, providing adequate cross bracing to mount the tanks and shale shaker.

Upon installation, the assembly is set on the ground with the treating tanks near the derrick floor and the shale shaker next to the shale pit. The individual parts are already connected, making it only necessary to flange up the mud return flow line from the surface casing and water connections. The liquids used to treat the drilling mud are conveniently located in rectangular tanks above the mud line and feed into the mud line just before the mud reaches the shale shaker.

When the well is completed and the rig is dismantled, it is only necessary to disconnect the steam line and miscellaneous fittings, and rack them in the cradle as illustrated. The mud return line is unflanged and the unit is ready to be moved.

PENBERTHY
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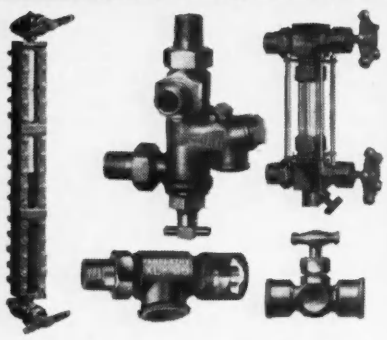

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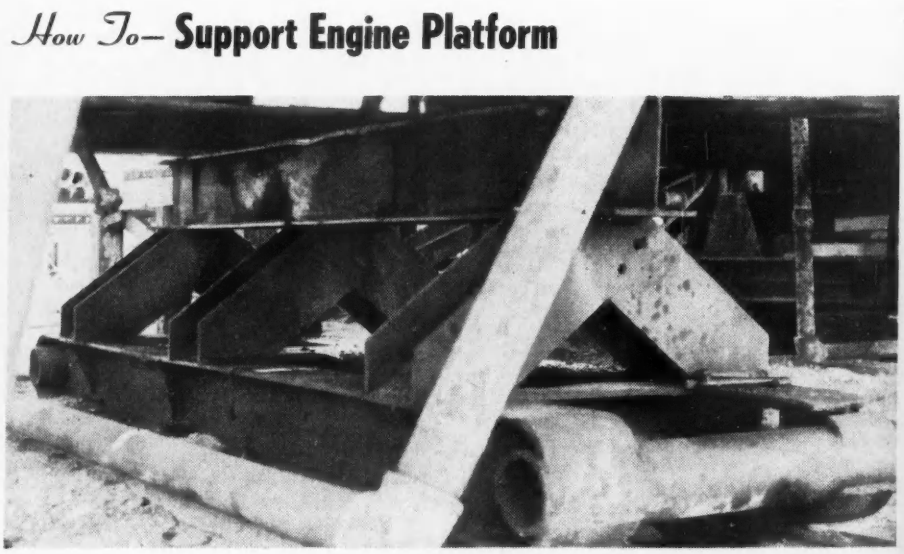
How To— Support Engine Platform



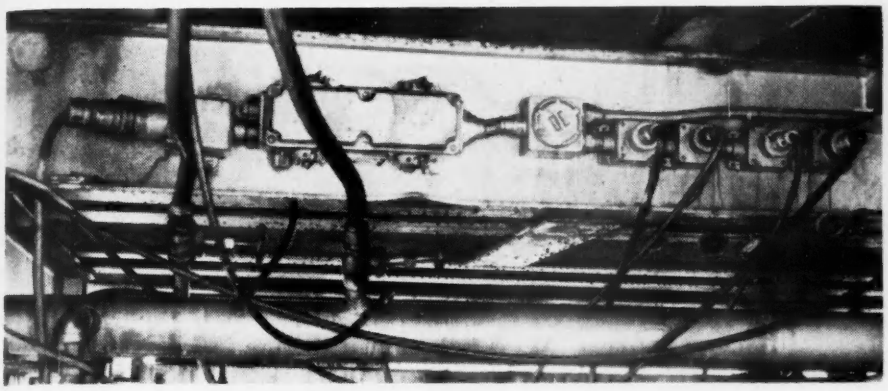
To save time, labor and material, a unitized set of cribbing can be made of heavy structural steel to support the base of drilling engines and the surrounding platform. The unit is made with a skid base of wide flange steel tied at each end with nipples of extra heavy pipe, and at intermediate points with structural steel to provide the degree of ruggedness necessary for such a support.

Short pieces of wide flange steel are cut, beveled and assembled by welding to form triangles which use the intermediate crossmembers as the base. The apex is cut flat to form a bearing surface for a horizontal section of structural steel which supports the sub-base of the drilling equipment.

This type of support eliminates the use of railroad tie, or derrick timber cribbing and can be set quickly and leveled up with additional planking placed between the derrick foundation mat or the soil at the location.

DRILLING HINTS

How To— Provide Multi-Socket Electric Outlet

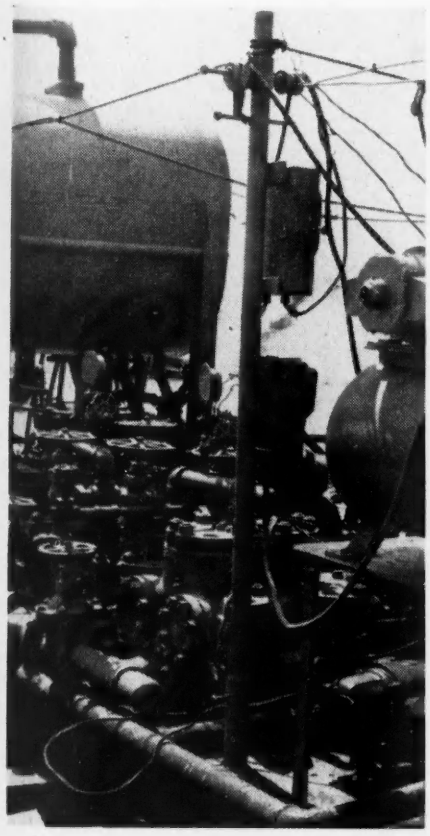


With the idea of saving time, permanent fittings, condulets and receptacles are attached to parts of the unitized substructures on a rig operated by a drilling contractor. Fixtures are provided for a large number of plug-ins, and a single socket is placed at the end of the structural steel sill where the lead from the generators can be fitted.

By mounting the electrical receptacles on the wide wall of the I-beam, additional protection is afforded these units by the flanges of the beam. The explosion-proof receptacles provide outlets for shale shaker motor, extension cords, and lighting under the substructure.

How To— Support Electrical Wiring

Electrical wiring carrying 220 and 110 volts from the generator plant to other parts of the drilling rig should be well insulated from equipment and suspended a safe distance above workmen's heads. One company designed and fabricated several supports as illustrated and located them at strategic points about the rig to provide adequate suspension of electrical wiring.



The support shown is made from two-inch pipe approximately ten feet long. Six and eight-inch studs are welded on either side of the pipe near the top. These studs carry the heavy insulators on which the wiring is mounted. Brackets are welded to the post at convenient heights to support the various switches in the circuit.

Base of the post is held in the vertical position by a short nipple of 2½-inch pipe which is welded to the skid of the generator unit. Another post may be located on the mud pumps in which case another such nipple would be welded to the pump skid. To insure a stable support, a hole is tapped in the short nipple and threaded. Into these threads is screwed a bolt which bears on the inserted two-inch post, thus holding it firmly in place. With several of these posts located between the rig and the boilers where the steam generator is normally located, the entire rig wiring system is easily and safely handled.

When tearing down for a move, it is only necessary to remove the wiring, unscrew the anchor bolt and remove the post. The base is always available for setting up and cannot become lost because of its location on the major pieces of equipment. It is relatively inexpensive and has paid out in ease of assembly and safety features offered.

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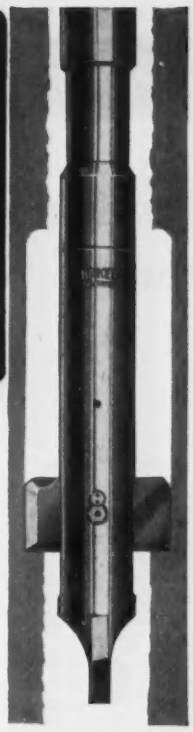

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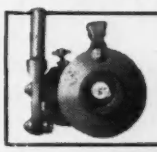

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Production, Runs to Stills Set Records But Demand Holds Stocks to Small Gain

The week ended September 13 was one of high activity as the U. S. industry set new all-time records in amounts of crude produced and processed, the latest report of the API revealed. Though refinery inputs were the largest in history, products recovered did little more than meet the week's demands and resulted in only a slight net gain in stocks.

Production of crude from U. S. fields averaged 5,217,000 barrels daily in the week of September 13 for an increase of 44,000 barrels a day over the previous week's record output. This also was 444,000 barrels a day or 9.3 percent more than was produced in the like week a year ago.

A new peak in daily crude runs to stills amounting to 5,318,000 barrels was reported. That represented an increase of 72,000 barrels a day from the previous week's run and 432,000 barrels or 8.8 percent over those of a year ago. In setting this record 93.8 percent of total U. S. refining capacity was used. The previous high had been 5,271,000 barrels daily in the week of August 2.

Stocks of refinable crude totalled 226,154,000 barrels on September 6, a drop of 2,127,000 barrels from a week before, but 3,022,000 barrels or 1.4 percent more than was held a year before. Not included in the above total were 5,254,000 barrels of non-gasoline bearing crude in California.

Production of gasoline, including natural blended at the refinery, totalled 16,505,000 barrels in the seven-day period. That was an increase of 300,000 barrels over the previous week's output and 1,613,000 barrels or 10.8 percent over that of a year ago. Stocks of finished and unfinished gasoline dropped 827,000 barrels to 82,509,000, which was 4,804,000 barrels or 5.5 percent less than was in storage a year before.

Distillate fuel oil production amounted to 6,053,000 barrels in the week, representing a decline of 284,000 barrels from the previous period's, but 452,000 barrels or 8 percent more than was made in the comparable period of 1946. Stocks of distillate fuel climbed 856,000 barrels to end the week at 57,619,000 barrels. That amount was only 279,000 barrels more than was being held a year before.

Refinery output of the heavier residual fuels was boosted 147,000 barrels and totalled 8,855,000 barrels for the week. A year ago production of these oils was 646,000 barrels or almost 8 percent less. Residual stocks totaling 56,168,000 barrels stood unchanged from a week earlier, and were 70,000 barrels less than a year earlier.

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

HIGHS AND LOWS OF RECENT YEARS

ITEM	Crude Oil Prod.		Runs to Stills		Crude Stocks		Gasoline Stocks		Gasoil and Distillate Stocks		Residual Fuel Oil Stocks	
	Barrels Daily	Week Ended	Barrels Daily	Week Ended	Barrels	Week Ended	Barrels	Week Ended	Barrels	Week Ended	Barrels	Week Ended
High:												
1942	4,337	2- 7	3,961	1- 3	263,208	3-28	[1]109,281	3-14	47,861	11-14	95,857	1- 8
1945	4,944	7-21	5,140	8-18	227,554	10-13	99,102	3-24	45,341	11-17	56,074	1- 6
1946	4,961	6-15	4,968	12-28	229,430	3- 2	105,223	2-16	[1]67,286	11- 9	61,036	11- 2
1947	[1]5,217	9-13	[1]5,318	9-13	239,370	5-31	107,576	3-29	58,034	1- 4	56,168	9-13
Lows:												
1945	3,621	10- 6	3,409	10- 6	[2]211,813	8-35	70,791	10-13	26,483	3-17	38,548	5-26
1946	4,403	3- 9	4,498	1-12	218,193	1- 5	85,324	9-28	25,131	3- 9	37,289	4- 6
1947	4,531	4-11	4,667	4-12	220,313	2- 8	82,509	9-13	31,470	4-19	42,668	4-26

TRENDS OF 1946 AND 1947

Trends in Week Ended	Crude Oil			Gasoline		Gasoil and Distillate		Residual Fuel	
	Production Daily	Runs to Stills Daily	Stocks Week End	Production Weekly	Stocks Week End	Production Weekly	Stocks Week End	Production Weekly	Stocks Week End
1946:									
January 5	4,548	4,651	218,193	14,488	98,494	5,923	35,199	8,867	42,371
January 26	4,626	4,553	220,544	13,622	101,737	5,720	29,498	8,411	39,722
February 23	4,714	4,595	226,699	13,175	104,709	5,728	25,398	7,913	39,290
March 30	4,425	4,684	224,994	13,896	104,715	5,337	28,240	8,738	37,746
April 27	4,672	4,685	224,443	14,228	99,531	5,568	30,466	9,204	39,404
May 25	4,759	4,857	222,214	14,312	95,769	5,463	32,973	8,908	48,368
June 29	4,957	4,854	223,883	14,500	92,333	5,325	37,762	8,828	46,477
July 27	4,926	4,896	223,756	14,535	88,626	5,817	44,316	8,217	49,517
August 31	4,833	4,911	227,132	15,014	87,217	5,630	53,134	8,539	53,173
September 28	4,778	4,829	223,043	14,675	85,324	5,632	59,827	8,172	57,657
October 26	4,730	4,758	221,184	14,863	86,423	5,710	65,499	7,728	60,872
November 30	4,795	4,707	227,693	15,145	88,371	5,258	66,062	7,672	58,647
December 28	4,713	4,968	225,995	15,604	93,126	5,931	58,941	8,181	53,427
1947:									
January 4	4,469	4,917	223,291	15,281	94,882	5,957	58,034	8,375	53,285
January 25	4,672	4,820	221,665	14,624	99,801	5,630	50,357	8,224	48,558
February 22	4,786	4,860	224,580	14,668	103,904	5,929	40,739	8,542	44,919
March 29	4,865	4,843	227,529	14,396	107,576	5,969	32,737	8,688	43,364
April 26	4,930	4,725	235,383	14,213	103,860	5,435	32,286	8,186	42,668
May 31	5,024	5,000	239,370	14,709	95,876	5,732	36,032	8,910	45,224
June 28	5,109	5,093	236,221	16,070	91,806	5,006	41,721	8,298	48,490
July 26	5,084	5,162	231,357	16,142	85,812	5,708	47,097	8,738	52,497
August 30	5,157	5,209	228,281	16,753	84,105	5,919	54,808	8,962	55,242
September 6	5,173	5,246	226,154	16,205	83,336	6,337	56,763	8,708	56,168
Sept. 13, 1947	[1]5,217	[1]5,318	.....	16,505	82,509	6,053	57,619	8,855	56,168
Sept. 14, 1946	4,773	4,886	[3]223,132	14,892	87,313	5,601	57,340	8,209	56,238
Change:									
In Week	+44	+72	—2,127	+300	—827	—284	+856	+147	.....
In Year	+444	+432	+3,022	+1,613	—4,804	+452	+279	+464	—70
In Year	+9.3%	+8.8%	+1.4%	+10.8%	—5.5%	+8.1%	+0.5%	+7.9%	—0.1%

[1] All time peak. [2] Lowest since December, 1921. [3] Stocks, September 7, 1946.

Five Suppliers Cut Prices For Light Refined Products

Price cutbacks for light refined products gained momentum in the early part of the week at Middle and South Atlantic points as five suppliers reported reductions, bringing the total such announcements to ten during the past two weeks. At the same time Standard Oil Company (Ohio) announced a general increase in its tank wagon prices for kerosine and light fuel oils.

Three Atlantic Coast suppliers reported their prices for gasoline and kerosine were cut .5 cent for all methods of delivery in North and South Carolina and .4 cent for No. 2 fuel oil. One of these extended similar reductions in tank wagon prices into Virginia. Another reported that although his prices for regular grade gasoline, kerosine and No. 2 fuel oil were unchanged at major Southeastern ports, he was reducing tank wagon quotations on these products through Georgia, Florida, Alabama, Mississippi and Kentucky.

At Baltimore, one supplier announced cuts of .5 cent for kerosine and .4 cent for No. 2 fuel, but price for regular-grade gasoline was not changed.

The remaining company, The Atlantic Refining Company announced reductions of .5 cent in tank wagon prices for gasoline and kerosine in North and South Carolina, effective September 15, and in Virginia, September 16.

Atlantic was the third company to announce reductions in parts of territory where Standard Oil Company of New Jersey has been considered by the trade as the price leader. The Texas Company and Shell Oil Company made their announcements of reductions a week earlier.

Standard Oil Company (Ohio) at the beginning of the week announced general increases in its tank wagon prices for kerosine and light fuel oils, effective September 15. Sohio's prices were upped .5 cent to 12 cents for kerosine and Nos. 1 and 2 fuels and to 11 cents for No. 3 fuel oil. The company's statewide tank car price for kerosine also was hiked .5 cent to 10.4 cents delivered.

• Oklahoma

Important Grady County Test Drills in Simpson at 13,704

Important wildcat venture cores below 13,704 feet; attempt being made to extend Witcher field to south; Kiowa County wildcat looms as possible pool opener; Dill field extended ½ mile south; Logan County wildcat recovers oil on drill-stem test of Wilcox sand; Carter extends Lindsay area 1 mile east; interesting wildcat staked east of Chandler townsite.

Grady County: One of the deepest drilling wells in the area is coring in the Simpson dolomite below 13,704 feet, after encountering good porosity and stains up the hole. Stanolind Oil & Gas Company's Briscoe Unit 1, CNW SE 4-4n-5w, was reported to have penetrated 35 feet of porous oil-bearing Deese sand at 8840 feet. Both the upper and lower Springer sands have shown porosity and stains, aggregating a thickness of 250 feet. Sands are reported relatively more porous than the Springer formation in the Chitwood pool to the West. Drilling evidence indicates a closed structure. It is expected that the well will penetrate more than 1000 feet of Simpson-Bromide formation, and observers believe the well will cut through thick sections of porous formations similar to those of the Lindsay pool to the east.

Oklahoma County: Peppers Refining Company will attempt to stretch the Witcher area more than 1½ miles south with Hayes 1, CSW SE 32-13n-2w. The test is 2 miles south nearest gas-distillate production in the field, and is 1½ miles southeast of Stanolind's Reinhart 1, which extended the field southeast to open oil production on the structure.

Kiowa County: A wildcat southeast of Hobart may open an oil pool. Royal Petroleum Company's Krieger 1, NW NW NW 10-6n-17w, pumped 6 barrels of oil and an equal amount of water per day from 960-75 feet. Total depth is 1497 feet. Several zones were tested before the well was plugged back to the shallow Pennsylvanian formation. A south offset to the test has been staked.

Okfuskee County: Anderson-Prichard Oil Corporation has successfully extended the Dill field ½ mile south with Keyes 1, SE SE SW 11-11n-8e. On a drill-stem test in the Cromwell sand at 3410-15 feet, the well showed gas in 10 minutes and recovered 450 feet of oil on a 1-hour opening. Casing was set at 3408 feet after electrical log was run.

Logan County: Woods Drilling Company was drilling to the second Wilcox sand at Crabtree 1, NW NE NE 4-16n-1e, wildcat east of the South Langston pool, after recovering oil and salt water on a drill-stem test of the first Wilcox. In a 45-minute test of the first sand at 5165-85 feet, gas showed in 38 minutes and blew out about 200 feet of oil. After closing tool, 420 feet of oil and 1200 feet of salt water were recovered.

Garvin County: The Carter Oil Company has completed a 1-mile east extension to the East Linday pool, on the Garvin-McClain county line. Bradshaw 1, CNW SE 4-4n-3w, was completed for 266 barrels of oil per day, flowing through 7/16-inch choke from the Pennsylvanian sand. Tubing pressure was 250 pounds with 620 pounds on casing.

Lincoln County: An interesting wildcat has begun a mile east of Chandler. Fred T. Haddock and Falcon-Seaboard Drilling Company have staked Logan 1, SE SE SE 10-14n-4e, on what is believed a perfect structure, with goal either the second Wilcox sand or 5100 feet. The well is in an area which seems to follow a trend with the Davenport and Chandler fields. The 1200-acre block was assembled by S. B. Logan.

• Kansas

Comanche County Well May Go Deeper Before Testing Shows

Comanche County wildcat continues to hold limelight; testing indicates good well for Marion County; McPherson County wildcat takes potential tests.

Comanche County: Continuing to hold the limelight in Kansas field operations is Stanolind Oil & Gas Company's Winkler 1, NE NE NW 6-31s-19w, 8 miles southwest of the Turkey Creek oil pool. Tools are below 5640 feet, and the test probably will be drilled deeper before several good gas shows encountered in the Mississippi lime are tested. The Mississippian was topped at 5018 feet.

Marion County: Continuous testing of Vedder Supply Company et al's Suderman 1, wildcat in SE NE 28-20s-2e, south of Hillsboro, indicates an oil pool opener. A good show of oil was found following acid treatment in the Viola lime, topped at 2942 feet. The test, a venture by Veeder and the National Co-Operative Refinery Association, is several miles from oil or gas production.

McPherson County: Potential tests are under way at Phillips Petroleum Company's Likins 1, wildcat in SW SE SE 14-17s-1w. The well will either open a new pool or extend the Crowther pool northeast. Tank battery has been set up for testing. Production is from 2842-53 feet in the Mississippi chat.

Indiana Terminal Planned

Plans for another large petroleum terminal on the Ohio River have been announced by Board Chairman Paul G. Blazer of the Ashland Oil & Refining Company. The company has purchased a 30-acre site at Clarksville, Ind., opposite the business district of Louisville, Ky., where it soon will begin the construction of a river landing, storage tanks, rail and truck loading racks.

Wells Completed in United States in Week Ended September 13, 1947

Data preliminary and subject to revision. Revised and more complete data on all completions and exploration shown in monthly summaries published in last issue of each month.

State or District	FIELD COMPLETIONS: New Wells: Oil	Dist.	Gas	*Input	Dry	Total	Old Wells Deepened	EXPLORATORY COMPLETIONS: Oil	Dist.	Gas	Dry	Total	ALL COMPLETIONS: This Week	Last Week	This Week 1946
Alabama											1	1	1		1
Arkansas	4				1	5	1				1	1	7	11	9
California	39		1			40					9	9	49	35	44
Colorado	5					5					2	2	7	2	7
Florida														2	
Illinois	29				24	53					2	2	55	42	39
Indiana	7				7	14					1	1	15	14	10
Kansas	26				9	35	3	2		1	9	12	50	53	31
Kentucky	4				2	6							6	10	7
Louisiana	20				8	28		1			2	3	31	50	25
N. Louisiana	15				5	20					2	2	22	32	20
S. Louisiana	5				3	8		1				1	9	18	5
Michigan	4					4		1			4	5	9	25	16
Mississippi	2		1			3					1	1	4	10	7
Montana	5		1			6					1	1	7	6	6
Nebraska														1	
New Mexico	10					10					2	2	12	12	13
New York	14		1	16	1	32							32	27	25
Ohio	3		12		9	24				1		1	25	22	37
Oklahoma	37		3	1	22	63	4	3		1	12	16	83	70	85
Pennsylvania	20		15	22	3	60	1						61	57	52
Texas	117	2	4		33	156	4	11	1	1	24	37	197	202	148
DISTRICTS:															
1—S. Central	3				2	5							5	6	5
2—Middle Gulf	4				1	5		1			4	5	10	9	[1]
3—Upper Gulf	7	2			6	15	1		1		5	6	22	24	7
4—L. Gulf-S.W.	16				3	19		3		1	1	5	24	18	32
5—E. Central	3					3		1				1	4	1	[2]
6—Northeast	5		1			6		2			1	3	9	10	20
7-B—N. Central	15		1		7	23	1	1			6	7	31	33	[3]
7-C—W. Central	4					4		2				2	6	5	[4]
8—West	35					35	1				3	3	39	34	31
9—North	20				12	32	1	1			4	5	38	50	47
10—Panhandle	5		2		2	9							9	12	6
West Virginia	3		11		3	17							17	25	18
Wyoming	4		2			6				1	1	2	8	5	4
Total U.S.	353	2	51	39	122	567	13	18	1	5	72	96	676	681	584

* Includes salt water disposal wells. [1] Middle Gulf included with Lower Gulf-S.W. [2] East Central included with Northeast. [3] North Central included with North. [4] West Central included with West.

Laboratory for Petroleum-Chemistry Research Endowed by Texas Oil Man

Plans for a $1 million petroleum-chemistry research laboratory in Houston were disclosed September 11 as dedication ceremonies were held at the Essar Ranch four miles west of San Antonio for the Southwest Research Institute, a non-profit scientific organization set up to help Southwest industry produce new products, develop new processes, profitable uses for waste products, and similar projects.

The dedication was culmination of a boyhood dream of 31-year-old Tom Slick San Antonio oil man and rancher who has endowed the Institute and two companion research projects, the Essar Ranch and the Institute of Inventive Research.

The Houston laboratory, now in the planning stage, is expected to require a minimum of 20,000 square feet. Site has not yet been chosen.

Approximately 20 scientists will staff the Houston laboratory. Among the problems it will deal with will be those of pipe line and oil field equipment, electronics, corrosion, oil and gas technology.

The Institute also has leased offices in the Oil & Gas Building, Houston, and will staff them with a liaison man to work with Gulf Coast industry.

George Strake, Houston oil man, and Col. W. B. Bates, attorney, were announced as members of the board of governors of the Institute. Other governors are C. F. Urschel, Earl Slick, W. M. Hammond, Leroy Denman, Jr., John Cox, J. V. McGoodwin, and Dr. Judson Swearingen, all of San Antonio, and James Hewgley of Tulsa.

In addition to the governors, a large group of trustees are to be named later. They will include men from all major population centers of the Southwest, and will serve in an advisory and consulting capacity.

Prominent men from all over Texas, including a delegation of ten bankers and business leaders from Houston, attended the dedication. McGoodwin, in opening remarks, said less than 2 percent of the nation's industrial research is now going on in the Southwest.

"In too many cases, we are shipping out our raw materials and other areas get the cream from added value through manufacture," he said. "The Southwest's greatest deficiency in its drive to become industrialized is technical know-how. This Institute can aid in correcting that."

"Your plan to establish a major branch in Houston represents foresight, since so much industry centers there," Col. Bates said. "This will mean much to small industry, which cannot afford its own laboratory and research facilities. It may mean more to large industry, by working on problems they have not been able to solve."

Hammond said the Southwest Research Institute, which will do industrial research, will operate on a basis similar to those of Mellon, Armour and Midwest Institutes. It will undertake research projects on a non-profit, fee basis in which the sponsoring manufacturer or association will underwrite costs for services rendered and retain the patent rights for all discoveries which might accrue from the specific scientific exploration.

Slick, the founder, who was a Phi Beta Kappa in Science at Yale University, is the son of the late Tom Slick, Sr., a nationally-known independent oil operator.

The Southwest Research Institute, of which the Houston laboratory and placement office will be units, resulted from young Slick's boyhood dream to set up a large scientific research institute to serve industry on a non-profit basis and thus substantially contribute to the Southwest's industrial expansion.

Full Program Planned for Wives of AIME Members

Wives and members of the American Institute of Mining and Metallurgical Engineers need have no fear of having nothing to do when their husbands attend the fall meeting of the organization in Tulsa October 8-10, for the Tulsa hosts have planned a full program for the ladies, including sight-seeing tours, fashion shows, luncheons, etc.

Mrs. P. P. Manion, Jr., chairman of the ladies activities committee, announced that on October 8, beginning at 2 p.m. a sight-seeing tour of the Tulsa area will be made, with Mrs. A. E. Pierce in charge. Other activities for the ladies will include a get-acquainted reception-tea, to be held October 8, at 3:30 p.m. Mrs. R. C. Earlougher will be chairman. A dinner-bridge party will be held October 8 at 6:30 p.m., with Mrs. C. W. McIntosh as chairman.

Thursday a luncheon-fashion show will be held at 1 p.m. with Mrs. L. E. Elkins and Mrs. C. V. Millikan in charge.

Members of the AIME will register at 7:30 p.m. October 7. At 8 a.m. October 8 a breakfast meeting will be held for divisional officers.

The first technical session will be held in the Crystal Ball Room at 9 a.m. October 8, with Howard C. Pyle of Los Angeles, and P. P Manion, Jr., associate chairmen.

Work on Plant Resumed

O. C. Schorp, president of The Carter Oil Company, has announced that construction of the 22,000-barrel refinery at Billings has been resumed after a one-month shutdown while construction cost estimates were being studied by the company. Original estimates of the cost of the refinery were approximately $9 million for an 18,000-barrel plant, but crude capacity was reported increased to approximately 22,000 barrels per day, with an increased cost of as much as $15 million. It was reported that the company's present 9000-barrel Billings refinery, which was acquired from Yale Refining Company four years ago, will be salvaged upon completion of the new plant.

Texas Properties Sold

Reno Oil Company has purchased the production of Beacon Refining Company in Archer, Montague, Wilbarger and Young counties, North Texas, an estimated average of 130 barrels per day from 35 wells.

• West Texas

Ector County Discovery Cuts 502 Feet of Ellenburger Pay

Ector County discovery cuts 502 feet of pay; TXL north extension completing; Gaines County wildcat completed on pump; Ellenburger discovery north of Dollar Hide flowing to tanks; Martin pool deep test gets oil flow; Runnels and Winkler wildcats have light shows.

Ector County: Phillips Petroleum Company and The Texas Company's Cowden-McEntire 1, Sect. 18, Block 44, T-1-N, T&P Survey, wildcat between the Goldsmith and Andector pools, is said by officials and geologists of the company to be one of the most important oil discoveries in West Texas in recent years. So far, 502 feet of Ellenburger lime pay has been drilled. The formation, topped at 8060 feet, has been drill-stem tested every 50 feet. Latest test at approximately 8500 feet recorded a flow of 110 barrels of oil per hour. Earlier test at 8281-330 feet flowed 2268 barrels daily; another at 8330-80 feet flowed 2520 barrels, both through 5/64-inch choke. Gravity is estimated at 44.5.

Phillips' TXL 1-P, Sect. 28, Block 45, T-1-N, T&P Survey, was finaling as a 2-mile north extension of Devonian production on the northwest side of the TXL field. Operators recorded a flow of 232 barrels of oil in 15 hours through ½-inch choke after swabbing. No formation water showed. The well is shut in for storage. Ellenburger production is ¾ mile south.

Shell Oil Company-J. C. Barnes have completed TXL 4-F-E, NW¼ NW¼ Sect. 28, Block 45, T-1-S, T&P Survey, a twin to their No. 1 well, and an Ellenburger producer. A natural flowing potential test recorded 506 barrels of 42.6-gravity oil through ¼-inch choke. No. 1-E-F, produces from the Devonian. Both wells are on the south side of TXL.

Gaines County: Honolulu Oil Corporation has completed its wildcat discovery, White & Shelton 1, Sect. 404, Block G, CCSD&RGNG Survey, 12 miles west of Seminole, for a pumping potential of 161.04 barrels of fluid (156.2 barrels of 31.5-gravity oil and 3 percent water). Production is from the Clear Fork. Total depth is 7003 feet. Operator has asked for a new field allowable and that the area be known as North Riley. Cities Service Oil Company's Riley 1, discovery to the southeast, is producing from the Tubb.

Two miles west of Seminole, Skelly Oil Company's M. S. Doss 1, Sect. 394, Block G, CCSD&RGNG Survey, took a core from 6779-97 feet and recovered dolomite with anhydrite streaks and scattered light bleeding oil and gas bubbles.

Andrews County: The Pure Oil Company and Humble Oil & Refining Company ran another drill-stem test in E. P. Cowden 1-E-A, Sect. 24, Block A-52, PSL Survey, Ellenburger discovery north of the Dollar Hide pool. Test from 10,068-120 feet flowed clean oil and gas in 35 minutes and was turned into storage in 45 minutes. Production was rated at 87 barrels of oil at the end of the second hour. Gravity of the oil was 44.1, and gas-oil ratio 504/1. Operators will deepen hole another 50 feet for another

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test. Humble already has staked a southeast outpost to the area, which will go to 10,000 feet.

Shell Oil Company and The Superior Oil Company's Lockhart & Brown 1, Sect. 22, Block A-41, PSL Survey, deep test on the east side of the Martin pool, kicked off after swabbing and flowed 390 barrels of oil, including the 195-barrel load used in swabbing. The latest 7-hour test gauged 97 barrels of oil cut with mud and no water. Testing continued.

Runnels County: Southern Minerals Corporation's wildcat K. V. Northington 1, T. Pratt Survey 365½, took a drill-stem test of the Bend of the Pennsylvanian horizon at 4099-107 feet. It recovered an ungauged amount of gas and 800 feet of oil and 100 feet of salt water. Operator will attempt to locate water inflow and shut off.

Sterling County: Plymouth Oil Company's Georgia Frost 1, wildcat in Sect. 39, Block 2, H&TC Survey, perforated at 8365-70 feet and swabbed sulfur water without shows of oil or gas. Testing will continue with an attempt to seal off the water. Previously the well obtained some oil. Drilled-out total depth is 8370 feet.

Winkler County: Magnolia Petroleum Company found light shows of oil on a drill-stem test of R. A. Wheeler 1, Sect. 13, Block 40, PSL Survey, deep test in the Wheeler pool. A test at the Fusselman of the Silurian at 9828-910 feet recovered, in addition to water blanket, 270 feet of oil and gas-cut drilling mud. It was deepened to 9930 feet for another test.

Three Hearings Scheduled by Texas Railroad Commission

Construction of a gas cycling plant in the Nordheim field of Karnes and DeWitt counties is contemplated by Wescol Oil and Gas Company. Hearing on the application will be held by the Texas Railroad commission September 23.

Scheduled for September 24 is a Commission hearing to consider the feasibility of merging the Brayton and Agua Dulce Fields of Nueces County. In the event they are combined it is contemplated that the present Agua Dulce rules will apply.

The application of General Crude Oil Company to waterflood the 2800-foot sand of the Esperson Dome field, Liberty County, also will be heard on September 24.

National Petroleum Council Moves Washington Offices

The National Petroleum Council's Washington offices were moved last week from temporary quarters on Connecticut Avenue to the Commonwealth Building, 1625 K Street, N. W.

The Commonwealth Building is in process of becoming the Capitol's oil center, with the API, the Mid-Continent Oil and Gas Association and several companies located there or planning to move in the near future.

Corrosion Report Issued

A preliminary report, "Literature Review of Corrosion of Metals and materials by Flue Gas Condensate," has been issued to cover current status of the American Gas Association's research project DGR-4-CH on that subject. The report is a summary of more than 50 articles already published on the subject. Laboratory work is now under way at Battelle Memorial Institute which is directed toward an intense qualitative and quantitative study of gas appliance corrosion particularly as applied to heating appliances.

THE OIL MAN'S CALENDAR

OCT. 6– 8	American Gas Association, Annual Meeting, Cleveland, Auditorium Hotel.
6– 8	ASME Petroleum Mechanical Engineering Conference, Houston.
8–10	AIME, Petroleum Division, Fall Meeting, Tulsa, Mayo Hotel.
10	California Natural Gasoline Association, Fall Meeting, Los Angeles, Ambassador Hotel.
13–15	American Association of Oil Well Drilling Contractors, Annual Meeting, Long Beach, Calif.
16–17	Texas Mid-Continent Oil & Gas Association, Annual Meeting, San Antonio, Gunter Hotel.
20–22	American Society of Mechanical Engineers, Fuel Division, Cincinnati.
23–24	American Institute of Mining and Metallurgical Engineers, Petroleum Division, Fall Meeting, Los Angeles, Elks Club.
24	Independent Natural Gas Association of America, Annual Meeting, Oklahoma City, Skirvin Hotel.
NOV. 5– 6	American Association of Petroleum Geologists, Regional Meeting, San Antonio, Plaza Hotel.
6– 7	American Association of Petroleum Geologists, Pacific Section, Annual Meeting, Pasadena, Calif., Huntington Hotel.
10–13	American Petroleum Institute Annual Meeting, Chicago, Stevens Hotel.
21–22	The Petroleum Electric Power Association, Annual Meeting, Corpus Christi, Tex., Robert Driscoll Hotel.
DEC. 1– 5	ASME Annual Meeting, Chalfonte and Haddon Hall, Atlantic City, N.J.
1948 JAN. 14–15	American Association of Petroleum Geologists, Regional Meeting, St. Louis, Jefferson Hotel.
MAR. 24–26	Natural Gasoline Association of America, Annual Meeting, Ft. Worth, Texas Hotel.
24–26	Southern Gas Association, Galveston, Texas.
APRIL 14–16	American Petroleum Institute, Southwestern District Meeting, San Antonio, Plaza Hotel.
21–23	National Petroleum Association, Hotel Clevelend, Cleveland.
26–29	American Association of Petroleum Geologists, Society of Economic Paleontologists & Minerologists, Society of Exploration Geophysicists, Annual Meeting, Denver, Shirley-Savoy Hotel.
MAY 4– 5	American Gas Association, Natural Gas Department, Annual Spring Meeting, Houston, Rice Hotel.
6– 7	American Petroleum Institute, Pacific Coast District Meeting, Los Angeles, Biltmore Hotel.
15–22	International Petroleum Exposition, Tulsa.
JUNE 30 July 2	American Petroleum Institute, Eastern District Meeting, White Sulphur Springs, W. Va., Greenbrier Hotel.
OCT. 4– 9	American Gas Association, Atlantic City.

Nomads Chapter monthly meetings: LOS ANGELES, second Wednesday, Jonathan Club. HOUSTON, second Monday, Ye Olde College Inn. NEW YORK, first Monday, Louis Sherry's. TULSA, third Wednesday, Hotel Tulsa.

• North Texas

Extension Finaled in Chalk Hills Field Archer County

Chalk Hill field extension completed; Denton wildcat pumper still making high percentage of water.

Archer County: Southern Petroleum Exploration Company and Charles E. Morrison's L. F. Wilson 1-D, Lot 1, Block 71, ATNCL Survey, extension to the Chalk Hill field, has been completed for 98 barrels of oil in 7 hours, or an estimated daily potential of 350 barrels of 44-gravity oil. Production is from 388-930 feet, after pay was shot with 210 quarters of nitro. Total depth is 4405 feet, plugged back to 3942 feet.

Wilbarger County: The Texas Company's C. Schmoker 1, wildcat in Sect. 9, Block 10, H&TC Survey, cored 6928-40 feet and recovered 3½ feet of lime with slight show of oil, 6 inches of shale, and 6 feet of lime. A drill-stem test recovered only mud. Drilling continued below 6966 feet.

Denton County: The Texas Company's wildcat, Dr. C. Saunders 1, J. Ayers Survey, 4½ miles south of Sanger, continued testing oil and water, with ratio about the same. After pumping 2½ barrels of oil in 2 hours, the well was shut down for repairs.

Grayson County: H. L. Hunt's wildcat McCullough 1, J. High Survey, 4 miles northwest of Sherman, is drilling below 3000 feet in sand and shale.

Cottle County: The Ohio Oil Company's Yarbrough 1, W. Shelton Survey, wildcat, is drilling below 6880 feet in lime and shale.

Montague County: Continental has 2 wildcats active in the county: W. G. Hawkins 1, Sect. 17, H&TC Survey, drilling below 5332 feet; and J. B. Williams 1, McKinney & Williams Survey, drilling below 6428 feet.

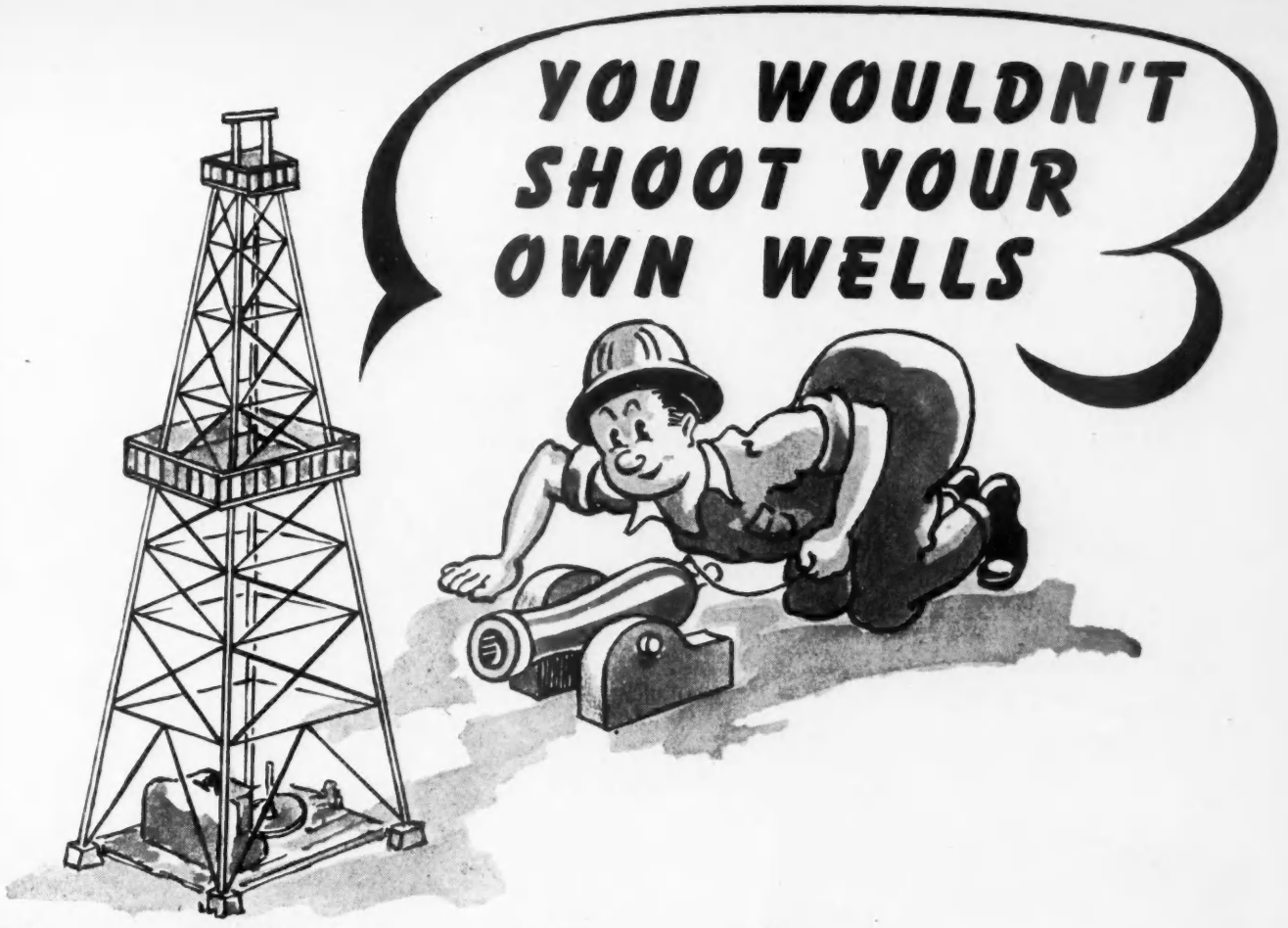
Under and Overproduction Continuation Is Requested

An order permitting the carrying forward of under-and over-production of gas on a periodic basis was requested last week at a hearing before the Texas Railroad Commission for the Chapel Hill field, Smith County. The order, which is similar to that in effect in the Carthage field of Panola County, was proposed by Etexas Producers Gas Company.

Joe Zeppa, who represented the applicant and Delta Drilling Company, said that his recommendation would apply to gas and distillate production from the Rodessa and Pettit zones. He testified that the demand for gas from the field varies very materially as between summer and winter—that the regular allowables of all wells are insufficient to meet the winter demand. Under present operations, said Zeppe, operators are voluntarily losing a portion of gas well allowables so that the casinghead gas from oil wells can be utilized.

Standard of Ohio Purchases Aylward Production Company

Standard Oil Company of Ohio acquired and will operate Aylward Production Company of Wichita, Kansas as a subsidiary. The firm bought 80 percent of Aylward's stock in exchange for 52,800 shares of Standard stock, which on the basis of its value this week ap-



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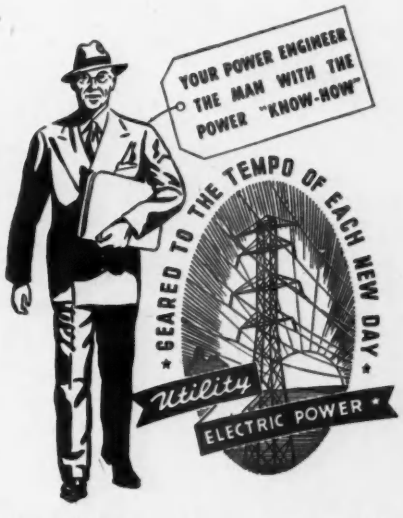

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proximates a consideration of $1½ million. Most of the Aylward stock not involved in the deal is reported owned by E. Max Beren and members of his family. J. A. Aylward's royalty interests were not affected. Aylward's production is estimated at 1100 barrels per day from leases in Kansas and Oklahoma.

Mountain Group Meets

Directors of the Rocky Mountain Oil and Gas Association, meeting in Casper September 10, amended bylaws of the organization by inclusion of new features, following the suggestion of a special committee. Sessions of the land and legal committee were held concerning federal land regulations. The annual meeting of the association will be held in Denver in November.

• East Texas

Discovery in Hopkins County Installs Pumping Euipment

Hopkins discovery installing pumping equipment; Harrison wildcat prepares to retest; important wildcat location made in San Augustine; Pettit gas area in Freestone County gets confirmation.

Hopkins County: Delta Drilling Company's W. H. Coker 1, Nacogdoches University Survey, new Lower Eagleford crude discovery 4 miles southeast of Reilly Springs, was installing pumping equipment for completion test. The well swabbed clean oil from 4150-65 feet, but failed to flow. Its pumping output is estimated at 200 barrels of 25-gravity oil daily. Total depth is 4210 feet.

Harrison County: Stanolind Oil & Gas Company's George Slaughter 1, wildcat in J. E. White Survey, wildcat, squeezed previous perforations, and successfully shut off formation water.

San Augustine County: D. H. Byrd et al was moving in and rigging up at T. W. Blount 1, E. Quirk Survey, wildcat 4 miles southwest of San Augustine, one of the most closely watched areas in East Texas since the completion of M. E. Davis' Pettit oil producer, W. A. Johnson 1, E. Quirk Survey. The new test will go to 10,000 feet. An offset to the discovery, Hiawatha Oil & Gas Company's Abbie Whitton 1, Quirk Survey, is drilling below 7000 feet.

Smith County: Chapel Hill Gas System has applied for discovery oil allowable rights at Bina Rayford 1, Thomas Payne Survey, which opened Travis Peak production for the Chapel Hill field, and which has a temporary allowable of 101 barrels daily, pending hearing by the Texas Railroad Commission, with provision that gas produced with the oil be consumed in the company's system. Operators are watching test now to see if it seems advisable to strip the Travis Peak gas output in either a plant of their own or by running through Lone Star Gas Company's Amigo plant.

Freestone County: The Texas Company's Esta Ervin 1, Frances O'Neal Survey, 1 mile from the company's Nancy Ham 1, Pettit discovery in the Teague area, was flowing 23 million cubic feet of gas per day with 3½ barrels of distillate per million.

C. P. Parsons Is Head of New Well-Service Organization

Backed with the long experience of C. P. Parsons, H. F. (Blackie) Clark, Turner Briggs, Bernie Thompson and others in the field of oil well cementing and related services, the Spartan Tool and Service Company has been formed with headquarters in Houston.

Offices have been obtained on the 21st floor of the Esperson Building and a service and shop building is located on the Old Spanish Trail near Arrowhead Park.

Initial plans call for a $3 million program of cementing equipment, bulk cement equipment, squeeze tools, open hole testing and related tools and services.

Spartan is starting business immediately with the Spartan Perfo-Tester, a combination casing perforator and casing tester which Clark has been developing and operating during the past two years. With this device, casing is perforated at the desired level and a test is immediately made of the productivity of the formation. In cases where a previous set of perforations has been squeezed and before another set is shot, the Perfo-Tester can make a dry test on the result of the previous squeeze job. The Perfo-Tester is then immediately ready to again perforate the casing and to make a productivity test of the formation. Perfo-Tester crews have already been trained by Clark and are ready to operate for Spartan.

Parsons will head the new organization; Clark will manage the field operations; Briggs will handle sales; and Thompson will handle exports. They are well known to the oil industry and have worked together for many years in the well-servicing business.

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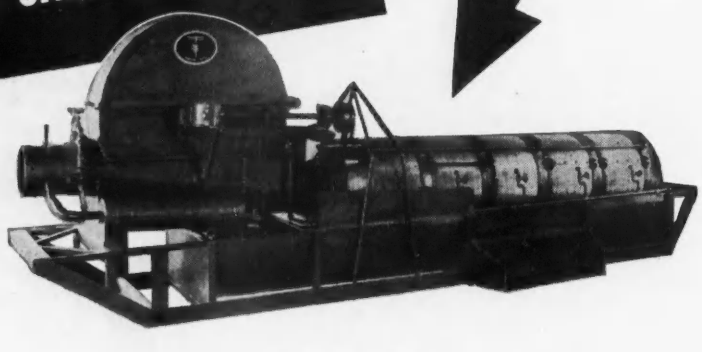

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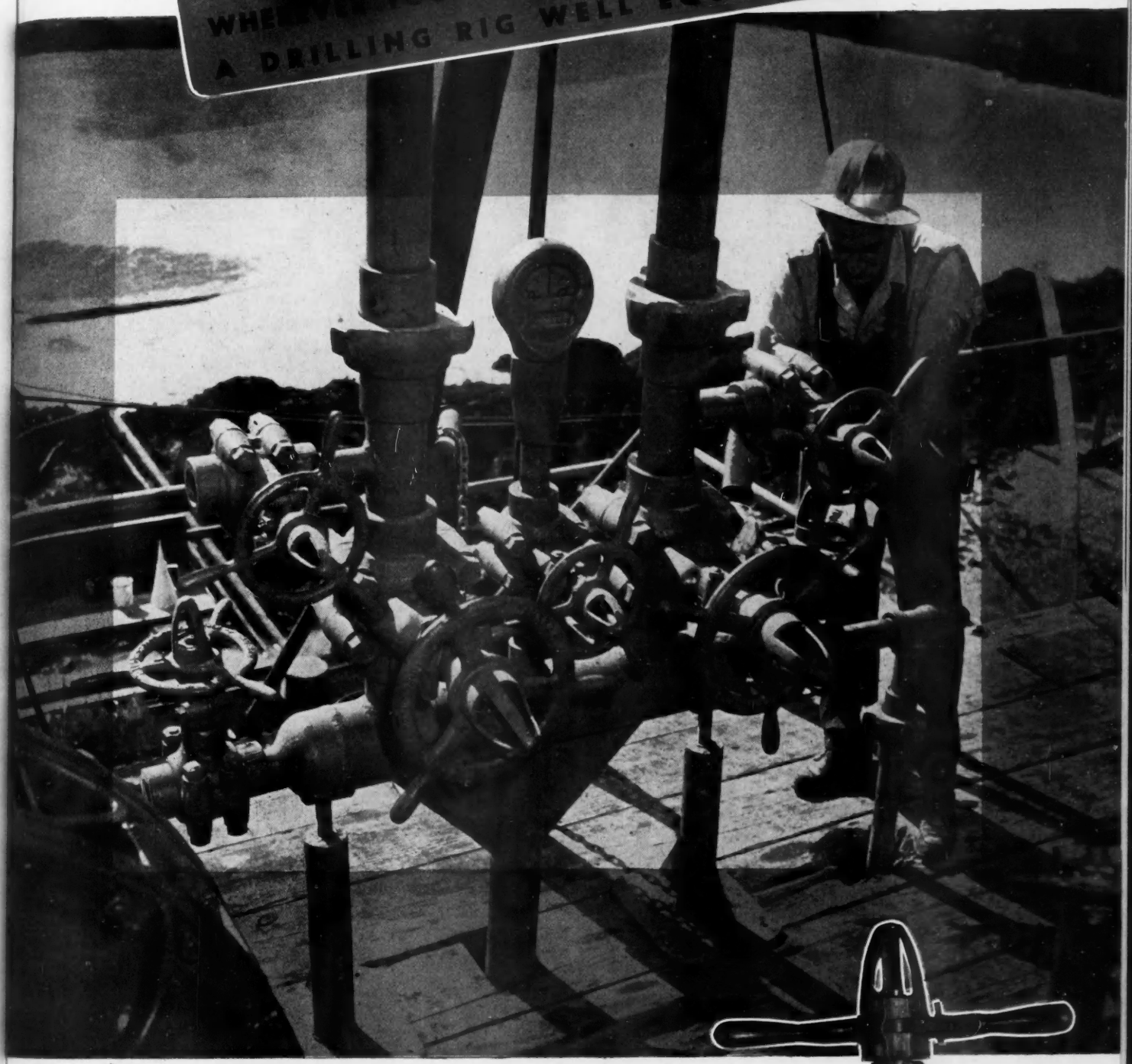

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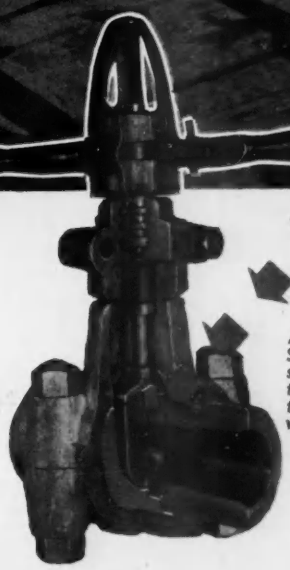
Available in 2000, 4000, 6000 and 10,000 lb. test pressure models. See your Composite Catalog for complete mechanical details or descriptive literature will gladly be sent on request.



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Standard and Affiliates Undertaking $400 Million Program of Expansion

One of the greatest expansion programs in the history of Standard Oil Company (N. J.), involving expenditures in excess of $400 million and instituted to meet consumer requirements for petroleum products, is being undertaken by the company and its affiliates throughout the world.

A survey by *The Lamp*, company publication, shows that $121 million is being spent in 1947 by domestic affiliates on producing activities alone. Humble Oil & Refining Company is drilling nearly 700 wells, while The Carter Oil Company is drilling about 200 this year. The program also includes sizeable expenditures for exploration activities.

Domestic affiliates, the survey reports, are making capital expenditures of nearly $60 million in 1947 for modernization and construction of refinery facilities. In 1948, the magazine predicts these companies will spend $75 million for refinery improvements. Carter recently announced resumption of work on its 20,000-barrel-a-day refinery at Billings, Mont., which, when completed, will be the largest in the Rocky Mountains area.

Standard Oil Company of New Jersey will spend $50 million in modernizing and enlarging refinery facilities at Linden, N. J., Baton Rouge, La., Baltimore, Md., and Charleston, S. C. Humble will enlarge its Baytown, Texas, refinery and increase the size of pipe line outlets from West Texas to gulf ports at a cost of about $7 million.

The largest single project undertaken within the Jersey organization is that of Creole Petroleum Corporation, which is spending $96 million building a new refinery, pipe line, tanker terminal and a complete town to house 2000 inhabitants at Amuay Bay, Venezuela.

Other expenditures of foreign affiliates include pipe line projects by companies in which Standard Oil Company (N. J.) holds an interest, in northern Arabia, and Iraq. These will cost approximately $149 million. The survey shows that in Europe, Jersey affiliates are spending $140 million, to enlarge manufacturing facilities at Fawley, on the southeast English coast, and in rebuilding a refinery at Port Jerome, France.

Tidelands Issue to Be Topic At Annual Meeting of IPAA

The nation's oil operators at the annual meeting of The Independent Petroleum Association of America in Oklahoma City September 29-30 will give special consideration to the ownership of tidelands.

This important question is to be reviewed by Price Daniel, attorney general of Texas, at the governor's luncheon September 30, when he speaks on "The Effect of the Recent Tidelands Decision." Presiding will be Roy J. Turner, governor of Oklahoma.

Governors of surrounding oil producing states will engage in a round table discussion of the issue following presentation of the subject by Attorney General Daniel. This discussion will be both general and specific as relating to future development of coastal areas, for it is assumed the court decision is applicable to the submarginal areas of all states. Each individual state, therefore, has a vital stake in a clarification of title to tidelands.

B. A. Hardey, president of IPAA, recently has discussed the Supreme Court decision by which the federal government was held to be the owner of tidelands, rather than the state of California, which for more than 100 years has exercised states rights on the land in question. Hardey stated that this decision throws an entirely new light on the question of state vs. federal ownership and implies that the decision is another encroachment on the rights of the various states. As such, the question now becomes one of national importance, and of primary concern to all coastwise states anticipating future development of mineral deposits in tidelands areas.

Texas, although not immediately affected, because the suit was limited to coastal areas off California, stands to have tideland development jeopardized and taxes obtained from such development reduced, assuming the decision of the Supreme Court is equally applicable to coastwise areas of Texas. Other coastal states are in the same position.

• Southwest Texas—Lower Coast

Discovery in Vicinity of Premont Field Is Finaled

Discovery in Premont field area finaled; first oil well in Los Indios gas field completed; Duval County wildcat tests gas and condensate.

Jim Wells County: Magnolia Petroleum Company's Seeligson 103, discovery 1½ miles southeast of the old Premont field and 1½ miles northwest of South Haldeman field, has been given potential test. The well gauged 144½ barrels of 42.5-gravity oil daily through ⅛-inch choke with 1220 pounds tubing pressure and gas-oil ratio 785/1. Total depth is 6010 feet with 7-inch casing set to 5907 feet and perforated at 5857-62 feet for completion.

Hidalgo County: The Chicago Corporation's W. L. Goldston 7, first oil well in the Los Indios gas field, has been completed for a potential of 86 barrels of 42-gravity oil daily on 3/32-inch choke with 1100 pounds tubing pressure and gas-oil ratio 400/1. Total depth is 7258 feet with casing perforated at 7113-22 feet for completion. This well is 1900 feet northwest of the Richard King 1 gas well and 2440 feet northeast of the Goldston 2 gas well.

Duval County: Magnolia's Drought 1-A, wildcat a mile northwest of Charamousca field, was testing gas and condensate. The well flowed at the rate of 1,365,000 cubic feet of gas daily through ¼-inch chokes on a 30-minute drillstem test of perforations at 6545 feet. A spray of condensate accompanied the gas flow. Additional section was perforated at 6550-65 feet in an attempt to make a condensate completion. Total depth is 8504 feet with 7-inch casing set to 7502 feet.

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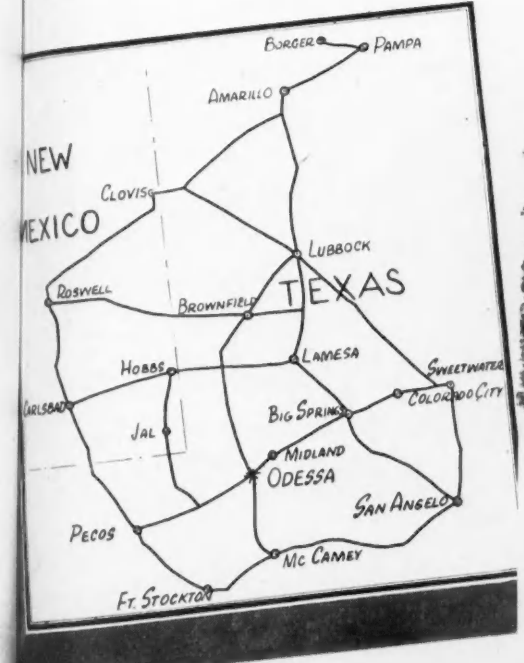

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• South Central Texas

Charlotte Field Mile East Extension Being Completed

Mile east extension to Charlotte field being completed; Humble completing Pleasanton area wildcat; 3100-foot wildcat located in Luling field area.

Atascosa County: Humble Oil & Refining Company was completing Matocha 2 as a 1 mile east extension to the Charlotte field. Total depth is 5290 feet with 5½-inch casing set to 5210 feet and the well being completed from open hole. A drill-stem test prior to setting casing at 5207-90 feet, using ¼-inch chokes, recovered 126 feet of oil in 20 minutes.

Humble set casing at Nelle-Gordon-Dinsmoore 1, wildcat 6½ miles northeast of Pleasanton, and production tests were under way. Total depth is 8124 feet in the Edwards lime with 5½-inch casing set to 8108 feet and tests being made in open hole. This wildcat tested gas-condensate and oil from 8003 to 8114 feet before casing was set. A test at 8094-104 feet recovered 120 feet of 33-gravity oil and a test at 8104-14 feet recovered 45 feet of oil.

Guadalupe County: A 3100-foot wildcat has been located 1½ miles southwest of Luling field by M. H. Dees of Mobile, Ala. The test is on a 50-acre lease in Gerren Hines Survey and 340 feet northeast of an abandoned hole on this lease.

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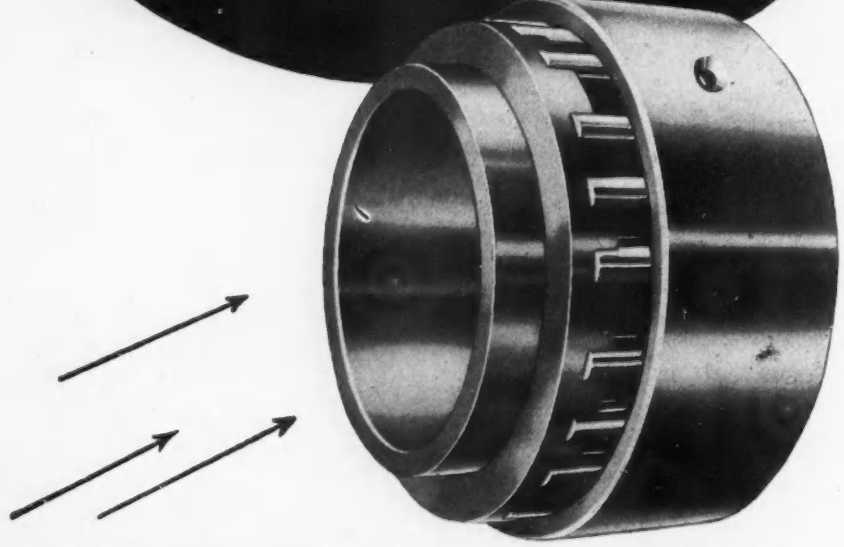

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• Middle Texas Coast

Casing Set in Continental Wildcat Near Albert West

Casing set in Continental's wildcat northeast of Albert West; Kittie field area wildcat has show of oil on drill-stem test; 2 wells being completed in southwest extension area at Strauch-Wilcox; wildcat in De Witt County recovers oil on drill-stem test.

Live Oak County: Casing has been set to total depth of 7329 feet in Continental Oil Company's Albert West 2-B, discovery a mile northeast of Albert West field. This well tested oil in the Slick sand at 6747-55 feet and in the Luling at 6939-43 feet. Gas-condensate was tested in the lower Slick sand at 6822-31 feet.

E. B. Clark's McClelland 1, wildcat a mile east of Kittie field, has a show of oil while drill-stem testing at 2605-13 feet. Using ¼-inch chokes, the well developed a slight blow in 30 minutes and recovered 700 feet of salt water and a show of oil with bottom hole pressure being 375 pounds open and 680 pounds closed. Following this test the well was shut down for orders at 2872 feet.

Bee County: Mills Bennett's Baker 1 has extended production at Strauch-Wilcox field 6000 feet southwest. From perforations at 7800-14 feet in the Luling sand, the well cleaned on ⅜-inch choke with 3000 pounds tubing pressure and 1300 pounds casing pressure, no gauge having been taken. Total depth is 8525 feet with 7-inch casing set to 7886 feet.

J. R. Dougherty's Minnie A. Nine 1, southwest extension area at Strauch-Wilcox field, waited on potential after flowing gas and condensate at the rate of 50 million cubic feet daily on open flow from perforations in the Luling sand at 7790-7820 feet. Total depth is 7852 feet with 5½-inch casing set on bottom.

De Witt County: Sunray Oil Corporation's Pena 1, wildcat 1-2/3 miles west of the Slick-Wilcox field, recovered oil on a drill-stem test. After coring a sand at 7530-36 feet, a 30-minute drill-stem test was made at 7531-36 feet. Using 500 feet of water cushion and ¼-inch chokes, it developed 76 pounds working pressure and recovered 1500 feet of water cushion and oil plus 1800 feet of salt water, bottom hole pressure flowing being 3120 pounds.

Huber Offices Moved

J. M. Huber Corporation has moved its land and geological offices from the Bankers Mortgage Building to 319 Oil & Gas Building, Houston.

• Upper Texas Coast

Standard's Discovery in Newton County Is Tested

Discovery in Newton County tested; Lucky field area discovery completed; Tyler County wildcat plugs back to Cockfield for tests; High Island production extended 2500 feet.

Newton County: A discovery that has attracted wide attention is Standard Oil Company of Texas et al's Earl Hankamer 1, wildcat on the old Gist prospect in R. L. White Survey, Sect. 22, A-

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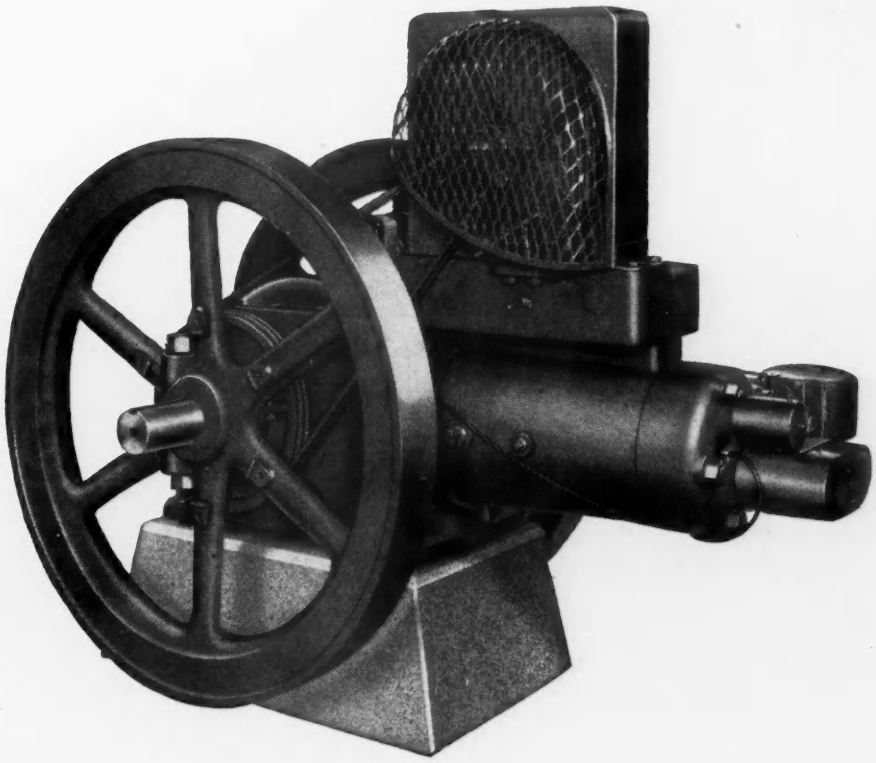

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922. This well was drilled to total depth by Peeler Brothers and turned over to Standard of Texas et al to set casing and take over activity on the lease. Total depth is 7354 feet with casing set to 5835 feet and perforated in the Frio at 5743-45 feet for initial tests. In 18 minutes the well developed 2200 pounds working pressue and recovered 540 feet of 30.8-gravity oil, 60 feet of oil-cut mud, and 30 feet of sand. Standard located Haetberg Lumber Company 1 as a confirmation test. It is 1650 feet from the east and 330 feet from the north line of a 600-acre lease in H. T. & B. Survey, Sect. 3, A-235, and approximately 2/3 mile southwest of the Hankamer 1 discovery.

Matagorda County: Stanolind Oil & Gas Company's C. J. Anderson 3 has been completed as a discovery or a 5535-foot east extension to the Lucky field. On completion the well flowed 194 barrels of 37-gravity oil daily through 3/16-inch choke with 620 pounds tubing pressure and 1180 pounds casing pressure. Total depth is 10,800 feet with 7-inch casing set to 9796 feet and 5-inch liner to 10,201 feet. Completion is from perforations at the 8550-foot level.

Tyler County: Amerada Petroleum Corporation's Charles G. Hooks 1 has been plugged back to test a Cockfield sand after making production tests in the Wilcox. Total depth is 9503 feet with 5½-inch casing set to 7800 feet and perforated for initial test in the Wilcox at 7609-20 feet. From these perforations the well flowed 94 barrels of fluid daily, 20 percent being salt water and the remainder 43-gravity oil.

Galveston County: On the northwest flank of High Island dome, John W. Mecom's Ker Cade 8-A was reported building tanks in preparation for a flow test. Total depth is 7412 feet with 7-inch casing set 1 foot off bottom and completion being made at the 7000-foot level. This well will result in a 2500-foot extension to the High Island field.

Texas Permits

Permits to drill 256 wells in Texas were approved by the Texas Railroad Commission last week. There were 65 in North Texas and 44 in Southwest Texas. West Texas reported 46 permits, and there were 29 from East Central Texas, 17 from the Gulf Coast, 36 from West Central Texas, and 19 from the Panhandle.

• South Louisiana

Beauregard Parish's Bivins Field Has Confirmation Well

Production confirmed in Bivins field; Kerr-McGee begins 2 Gulf of Mexico wildcats; Four Isle dome outpost tests gas and condensate; confirmation test in Tigre Lagoon discovery area waiting on potential.

Beauregard Parish: The Atlantic Refining Company's Newport Industries 2 has confirmed production in the new Bivins field. Located in 11-5s-12w, approximately 1000 feet west of the No. 1 discovery well, the Newport Industries 2 flowed an initial gauge of 151 barrels of daily through ⅛-inch choke. Total depth is 7361 feet with 5½-inch casing set to 7353 feet and perforated at 7236-44 for completion. This is the fourth test Atlantic has drilled in this area. The discovery was offset on the north and east by dry holes before the present well was drilled.

Terrebonne Parish: Operations have begun at 2 wildcats being drilled in the Gulf of Mexico by Kerr-McGee Oil Industries, Inc. State 1, Lease 750, is on Block 28, approximately 12 miles northwest of the old Coon Point prospect. State 1, Lease 754, is on Block 32 approximately 12 miles south of Point Au Fer field. It is reported that Stanolind Oil & Gas Company and Phillips Petroleum Company are associated with Kerr-McGee in drilling these wells.

On the east flank of Four Isle dome, The Superior Company was testing State 2-Unit 12, 24-21s-16e. Total depth is 14,220 feet with 7-inch casing set to 14,028 feet. Perforations were made at 13,467-75 feet to test a deep sand logged at 13,423-76 feet. On initial tests the well flowed gas and condensate with no gauge taken.

Vermilion Parish: Union Oil Company of California was waiting on potential tests at Billeaud-Planters 1, confirmation test in the Tigre Lagoon discovery area, 32-13s-5e. Perforations were made in a new sand at 11,638-55 feet where the well flowed gas and condensate through 9/64-inch choke with no gauge taken. Total depth is 12,229 feet with 5½-inch casing set to 12,033 feet. This well is 3000 feet southwest of Union's Landry 1 discovery and approximately 3½ miles west of Avery Island field.

• Arkansas

Falcon Field Area Wildcat Runs Test of New Pay Zone

Falcon area wildcat tests new pay; Spirit Lake field gets dual pay production; Wesson extension still getting water encroachment.

Nevada County: Sohio Petroleum Company's Louie Pelt 1, C NW SW SW 9-15s-22w, Falcon field, has indications of becoming a new pay for the area. From a sand below the Tokio, Sohio recovered 1710 feet of 27.7-gravity oil during a 20-minute drill-stem test at 3106-11 feet. A break was found at 3106 feet, and a core at 3108-11 feet obtained 1 foot of saturated oil sand. Another core, after a drill-stem test, obtained 1½ feet of sand showing oil from 3111-16½ feet, and a second test of that level recovered 5 stands of oil-cut water and 8 of salt water. Drilling is down to 3744 feet, and casing was being run for production test.

Lafayette County: Magnolia Petroleum Company was running casing to complete Moore Heirs 5, SE NE 14-16s-25w, Spirit Lake field, having found oil saturation in both the Paluxy sand and Kilpatrick lime. Total depth is 4232 feet.

Ouachita County: T. W. Lee and R. W. Burnett's E. H. Morgan 1, C NE SW SW 27-15s-19w, possible 1½-mile southwest extension for the Wesson field, was reported pumping 9 barrels of fluid per hour, 24 to 30 percent salt water with oil. The test was perforated with 102 shots in the Hogg sand at 3068-105 feet. A squeeze job will be run to eliminate water. Total depth is 3142

Only Production Can Stop Inflation

If you make automobiles or saw lumber, and your product is as scarce as such products are now, price is not important. Moreover, the black market will make more money than you. But when dealers get more cars and lumber than they can sell readily, so that John Public has a choice, it will be up to you to operate economically and sell reasonably. Only production can halt inflation and kill the black market. Truman knows this. So does Congress. But it pleases Socialists and Communists and labor leaders and diverts the economically ignorant to have politicians point an accusing finger at "big business." Big business, which realizes an average profit of 3.2% on its investment!

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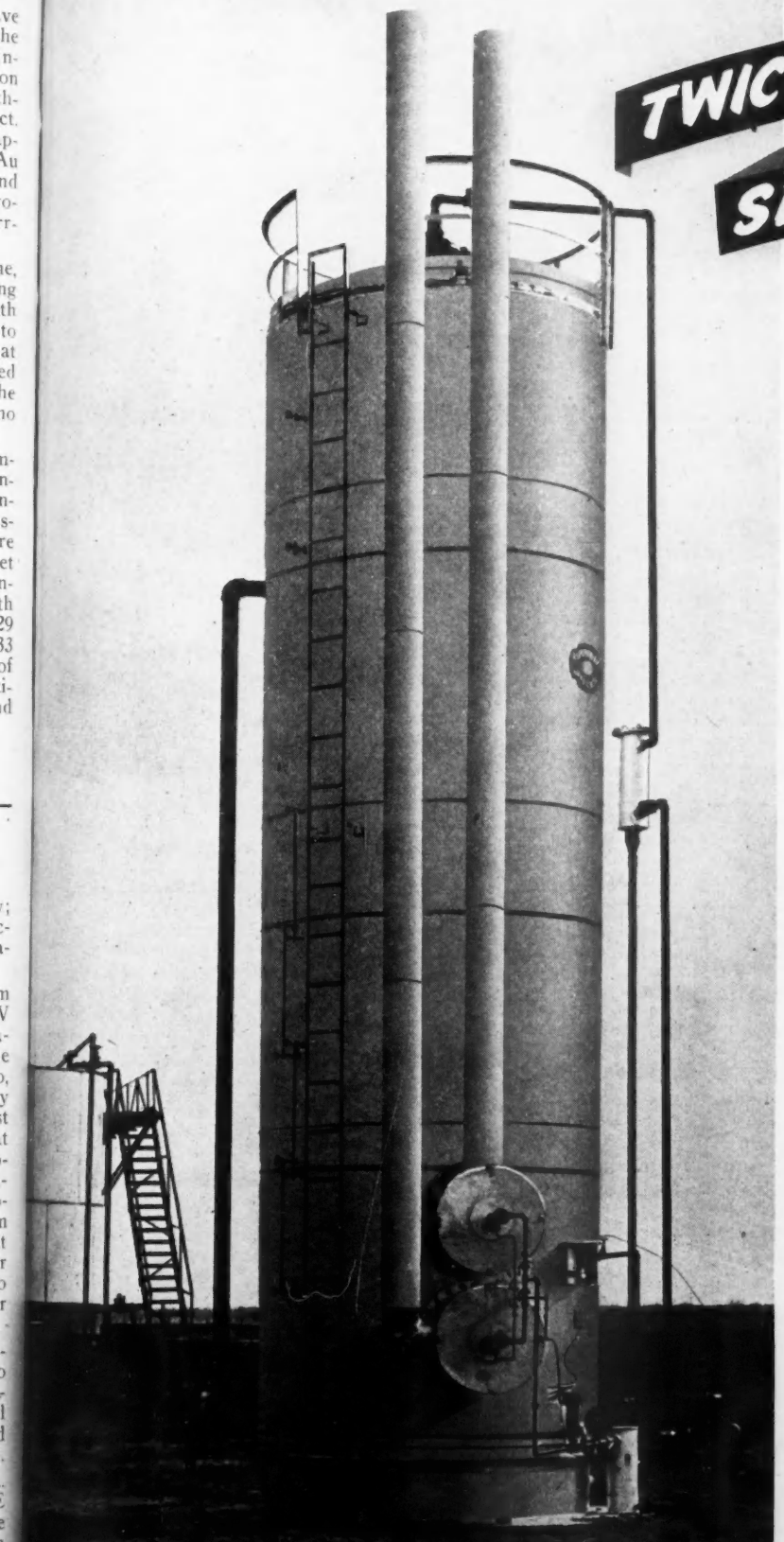

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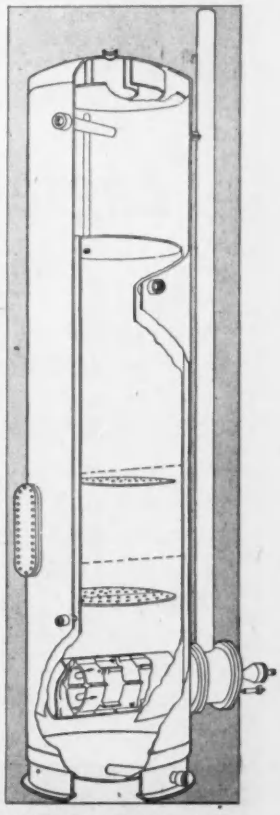

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feet. There are 3 other tests already drilling in the area.

Columbia County: McAlester Fuel Oil Company's wildcat W. N. Paschal 1, C SW SW 19-15s-20w, Cottage Hill area, is drilling below 6022 feet. Cotton Valley was topped at 4761 feet.

• Mississippi

Franklin County Has Good Discovery East of Cranfield

Franklin County has important discovery; Gulf's Hinds County wildcat is below 4475 feet after logging good shows; Jones County test attempts to establish commercial production.

Franklin County: J. C. Hawkins' Lehmann 1, NEc 27-7n-2e, wildcat 10 miles east of the Cranfield field in Adams County, has successfully tested large quantities of oil from the Massive sand zone to estiblish what may be the largest new oil strike in the state for the last two years. Operating on a farmout from Sells Petroleum Company, Hawkins drilled to the contract depth of 10,500 feet without meeting encouragement. It is at this depth that the Massive sand zone is usually encountered in the section, but the well was running high on structure and the driller elected to continue downward. At 10,545 feet a drill-stem test was made and in 15 minutes the well filled with 4500 feet of 40-gravity oil. According to reports the oil shot up over the derrick as the tools were withdrawn. No official reports are being issued on subsequent tests but it is understood that so far 11 feet of saturated sand have been developed with core tests to be made further down the hole.

Hinds County: Gulf Refining Company's R. W. Trotter 1, NEc NW NE 15-7n-2w, is drilling below 4475 feet after having fairly good shows. Cores at 4409-18 feet recovered sandy lime with shows of heavy oil. A drill-stem test at 4410-18 feet recovered oil-cut mud with considerable amounts of salt water.

Continental Oil Company's H. R. Bryant 1, SE SE 9-5n-4w, wildcat, was preparing to continue with core tests. Cores at 8830-8934 feet recovered shale and sandy shale with no shows. Only shows noted so far were at 5408-808 feet, where spots of dead oil stain were recovered.

Covington County: Humble Oil & Refining Company's Covington City Board of Supervisors 1, SWc 16-9n-17w, is drilling below 9087 feet. A drill-stem test at 8235-48 feet recovered only water cushion and salt water.

Jones County: Union Sulphur Company's A. E. Fall Estate 1, NWc 8-9n-10w, is undertaking to establish commercial production after releasing rig. After casing was perforated at 5412-20 feet and thoroughly tested the well swabbed at the rate of about 20 barrels a day. Union's Earline Parker 1, NEc 31-10n-10w, wildcat was testing on pump. After acidizing at 5450-55 feet the well pumped at the rate of 20 barrels a day. Kerosine was introduced into perforations and the well swabbed. Present recovery is kerosine and oil. Gulf Refining Company's L. L. Majors 1, SEc NE 29-6n-11w, is bottomed at 11,251 feet and conditioning hole for further tests after a drill-stem test at 13,046 feet failed.

Jasper County: Danciger Oil & Refining Company's C. J. Simmons 1, NEc 36-1n-12e, which is drilling below present productive levels in the East Heidelberg field, was preparing to set casing after running electrical log to 9493 feet. Shows of oil were noted in cores below 8400 feet, but nothing definite has been established.

Stone County: Geo. Vasen's Fee 1, SW NE 9-2s-11w, which previously had been abandoned at 11,209 feet, has resumed drilling and is working below 11,804 feet. No shows have been noted in the deeper sections.

Alabama

A. R. Temple's Smith Lumber Company 1, NWc 26-8n-16e, Crenshaw County, which is scheduled to go below 7000 feet, is drilling at 6559. No shows have been reported.

Escambia County: H. L. Hunt's T. R. Miller Mills Company 6, NW SE 7-2n-11e, is drilling below 4245 feet in its drive for the Eutaw Tuscaloosa zone.

Clarke County: Amerada Petroleum Corporation's Thomas 1, NW NE 30-7n-2e, has bottomed at total depth of 4706 feet and was running sidewall cores. No shows have been reported.

Choctaw County: H. L. Hunt's wildcat, Robert Land 6, C NE SE 24-11n-5w, went to total depth of 5636 feet, and plugged back preparatory to running production casing.

Florida

Only two wildcat prospects were active in the state and neither had progressed to the vicinity of productive pay.

Hardee County: Humble Oil & Re-

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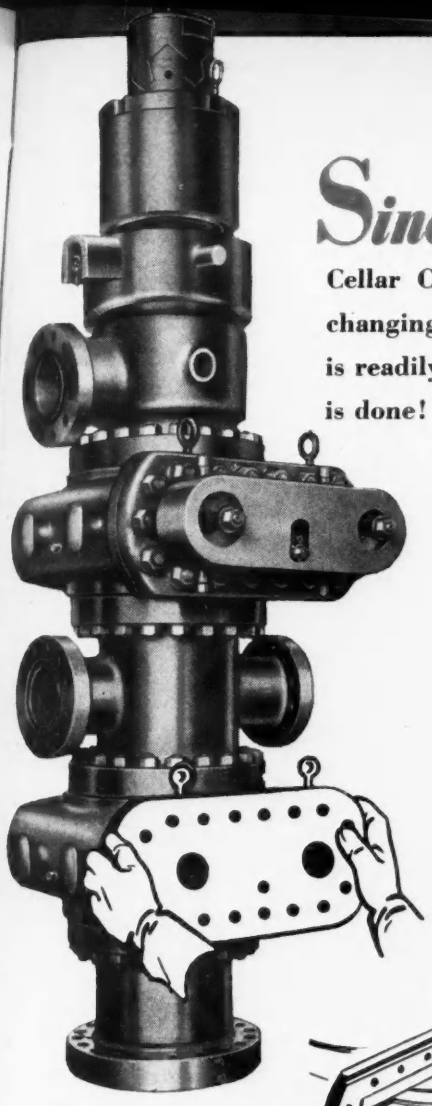

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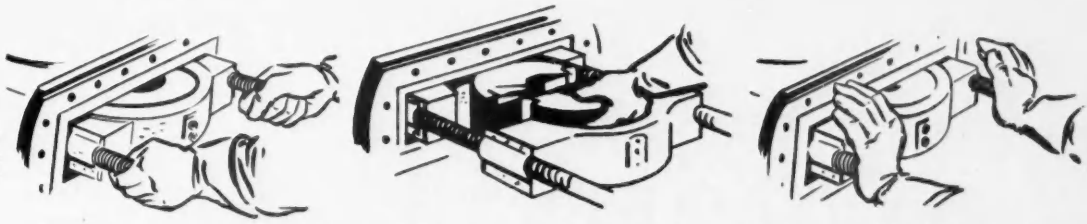

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3 Lift out old rams and install new rams to fit requirements . . .

4 . . . slide the assembly into the body, replace the one end cover . . . and the job is done!

. . . and there are many other unique Shaffer advantages!

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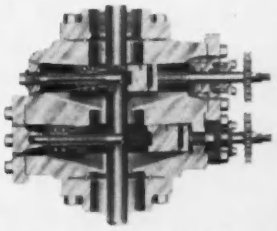

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fining Company's B. T. Keen 1, SEc 23-35s-23e, was drilling at 2480 feet.

Levy County: Coastal Petroleum Company's J. B. & J. T. Ragland 1, SWc 16-15s-13e, was waiting on cement after setting surface casing to a depth of 410 feet.

Collier County: Humble's Sunniland test, Gulf Coast Realties 11, C N½ NW SW 20-48s-30e, acid treated open hole from 11,550-73 feet, total depth. Flow of 2 barrels of fluid per hour was recorded before the well went dead. Operators were swabbing oil and acid water, and will rig up pump to complete.

• Ohio

Canton Field Area Test Is 3-Mile West Extensioner

Canton field extended 3 miles west; Medina pays in Tropic pool and carries water to the east; Big Clinton well in Salt Creek; Sego pool gets big play.

Stark County: Republic Steel Corporation's wildcat on fee property in the west part of Perry Township, NW NE 19, was completed with 2 gas pays. Shell at 4063-100 feet gauged 395,000 cubic feet and Red Clinton at 4140-73 feet gauged 330,000 cubic feet. The white clinton at 4173-85 feet was broken and dry. After shot the well was shutin at 480,000 cubic feet.

Morgan County: Zanesville Tool and Supply Company's Dell Rambo 2, NE SE 26 York township, had only a small show of gas in the Clinton at 3861-98 feet, and was drilled on down to the Medina. Top of the sand was reached at 3962 feet and finished at 3974 feet with a natural gauge of 500,000 cubic feet with a rock pressure of 1150 pounds.

A mile east of the Rambo, Smith and Smith ran into water in the Medina sand in a test at Charles Bush, SW SE 25. Drilling was stopped at 3979 feet and the well plugged back to shoot the Clinton sand.

Muskingum County: The Salt Creek Development Company hit a big flow of gas in U. S. A. 6, NW SE 15 Salt Creek township. Clinton sand at 4213-28 feet paid at 4218-28 feet for a total of 3,110,000 cubic feet with a rock of 1110 pounds.

Perry County: Madison township is getting a big play, encouraged by the good Pennsylvania Grade production in the south part of the township. Eight wells are drilling and 6 locations have been made.

• Michigan

Allegan County Test Rated Probable Small Pool Opener

Allegan County test is probable opener of small pool; Ionia County may have Dundee pool opener; Newaygo County test has water in Traverse.

Allegan County: Ford Oil Company's Bloom 1, SE NE NE 34-4n-13w, 4 miles north of the Brenner-Monterey oil pool, recovered an average of 65 barrels oil and 10 to 15 barrels of water after a 500-gallon acid treatment to Traverse lime pay at 1679-80 feet. The test is rated the probable opener of a small pool.

Ionia County: T. F. Caldwell's McKenna 1, SW NW SE 4-8n-10w, a mile southeast of the Bloomer (Traverse lime) pool, showed 1200 feet of oil and a trace of water in Dundee lime at 3020-38 feet and will be acidized. The test is being watched as a likely Dundee pool opener.

Newaygo County: Sun oil Company's Bryg 1, NE NW NE 18-14n-13w, 12 miles northeast of Kimball Lake field, logged Traverse lime at 2203 feet and showed water at 2213 feet. It will be carried deeper to test Dundee-Monroe section.

• Illinois Basin

Wayne and White Counties, Illinois, Have Pool Openers

Wayne and White counties, Illinois, have pool openers.

Illinois

George and Wrather's Turner 1, NW NE NW 23-1s-9e, Wayne County, 3 miles southwest of the Massillon pool, is opening an area with production from the Rosiclare at 3340-45 feet. The well swabbed 100 barrels of oil in 8 hours after 3000 gallons of acid.

One and three-fourths miles southwest of the same pool, Collins Brothers' Flowers 1, S½ SE NW 27-1s-9e, swabbed 35 barrels in 24 hours after 500 gallons of acid in McClosky lime at 3375-80 feet. Operator was placing the test on pump.

Tuly Carter's Martin 1, NW C 4-2s-8e, 2 miles east of production in the Boyleston pool, swabbed 2 barrels of oil per hour from Aux Vases sand at 3175-95 feet. Operators were testing after a 20-quart shot.

White County: Keating Drilling Company's Duckworth 1, SE NE NW 7-4s-9e, 3 miles southwest of the Leach pool, swabbed 10 barrels of oil per hour from O'Hara at 3415-20 feet after 1500 gallons of acid, and swabbed 2 barrels of oil per hour from McCloskey lime at 3520-35 feet after 3000 gallons of acid.

Indiana Farm Bureau's and B. M. Heath's Fuller 1, SW SE NW 21-5s-9e, 2 miles northeast of the Stokes pool, swabbed 78 barrels of oil in 12 hours from Aux Vases sand after drilling plug to pay at 3190-3200 feet.

• Rocky Mountain Area

Sand Coulee, Wyoming, Test In Frontier After Oil Show

Park County, Wyoming, wildcat drills in Frontier after testing oil in Peay; Church Buttes wildcat completed for 17,400,000 cubic feet of gas; San Creek discovery estimated good for 1000 barrels daily on open flow.

Wyoming

Seaboard Oil Company and Resolute Oil Corporation are drilling ahead at Northern Pacific 53-33, NW SW NE 33-58n-100w, Sand Coulee, Park County, 5 miles west of the Elk Basin field. The well is now below 6315 feet in the Frontier section after testing oil in the Peay sand at 5915-90 feet. The well made 4 barrels of 43.4-gravity oil on drill-stem test at 5918-90 feet with tester open 2 hours. The well is estimated good for 75

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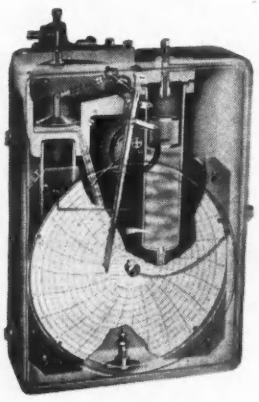

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to 100 barrels of oil daily from that zone, but may be drilled as deep as Tensleep formation at around 9000 feet.

Uinta County: Mountain Fuel Supply Company has officially completed Unit 3, NE SW NE 12-16n-113w, Church Buttes, for a gauge of 17,400,000 cubic feet of gas with approximately 250 barrels daily of 48.5-gravity condensate through ½-inch choke. The well is 1½ miles west of the discovery and the top of the Dakota sand was 308 feet lower structurally than in the discovery. Dakota sand was logged at 12,933 feet, with total depth 13,063 feet. This well is the deepest ever drilled in the Rocky Mountains. Rock pressure on the well was logged at 5400 pounds per square inch. The well was spudded August 21, 1946, and rig was moved off July 22, 1947. Some delay in drilling was caused by a fishing job after 7-inch casing had been run to 12,944 feet. This well has an official open flow of one-half that of the discovery well, which was completed in July, 1946.

The discovery was rated good for 35 million cubic feet of gas daily, through choke, with approximately 300 barrels of 48-gravity condensate daily. None of the gas from this field has been marketed, although Mountain Fuel's Wyoming-Salt Lake City gas line is within a few miles of the wells. The company is now giving final tests to Unit 2, on the north side of the field.

Washakie County: General Petroleum Corporation's first gauge of the Sand Creek discovery well at Government 45-26, NE NE SW 26-46n-91w, southeastern section of the Big Horn Basin, showed 587 barrels of 48-gravity oil through ½-inch choke in 23 hours, and the well is estimated good for 1000 barrels of oil daily open flow. On ¼-inch choke the well made 350 barrels of oil in 24 hours, and testing continued on 13/64-inch choke. The gas-oil ratio was high with 1,450,000 cubic feet produced with the 587 barrels and 813,000 cubic feet produced with the 350 barrels. Casing pressure was 1400 pounds and tubing pressure 650 pounds on ¼-inch choke. Production is from the Third Frontier sand at 6690-753 feet, total depth. The company is now in the process of unitization of this structure, as well as South Fork, five miles west, where production was found in the Embar formation early this year.

Weston County: Morton Oil Company's Johnson 1, NE NW NE 17-44n-63w, a ¼-mile west extension to the Mush Creek field, produced a total of 1740 barrels of oil in the 24 hours following drilling of plug. In the first hour the gauge was 85 barrels of oil through open 3-inch gate on 6⅝-inch casing. In the second hour the well made 80 barrels of oil and in the first six hours gauged 500 barrels. Production is from the Newcastle sand (Muddy) topped at 4142 feet with total depth 4179 feet. This is the best producer drilled in the Mush Creek area. Production in the field is on a monocline with lensed sand conditions in the Newcastle sand. Oil from the wells is trucked into the town of Newcastle for processing in 2 small refineries.

Colorado

The Carter Oil Company has abandoned Unit 1, wildcat in C SE SE 39-8n-90w, Moffat County, on the North Craig Unit, after making tests of oil shows in the Mesaverde section. The well was drilled to 9000 feet, total depth, in the Mancos shale and tests were made at 7700-900 feet. Some oil- and gas-cut mud was recovered but the sands were not found commercial. Carter unitized 15,000 acres in this area last year and has now assembled an estimated 50,000 acres southeast and northwest of the unit. The company has not announced whether or not additional drilling will be done in the area.

Utah

Pacific Western Oil Corporation's deep wildcat at Gordon Creek at Unit 1, C SE NE 24-14s-7e, probably will be drilled to the base of the Coconino before plugging back for a series of tests of gas shows in the Kaibab, Sinbad and Dakota sections. The well is now below 11,947 feet and is the deepest ever drilled in the state.

• California

San Luis Obispo County Holds Interest in Coastal Area

San Luis Obispo County center of wildcatting interest in Coastal area; new producing area near McKittrick likely to be small with second well coring gray sand; drill pipe finally recovered in Kettleman Hills Middle Dome Eocene discovery.

San Luis Obispo County: Interest of oil prospectors in this county's oil possibilities has shown an upturn in recent weeks with the result that there are now 3 important wildcat projects under way. A new organization, Sand Dune Oil Company, headed by James Michelin, has staked a test on the Leroy property, just west of Guadalupe and 4½ miles northwest of the west side field at Santa Maria. The well is on a block of 2700 acres and not far from the old Tiber field at Arroyo Grande.

Danziger Oil and Refining Company was grading location for Twitchell 1 in the Huasna area 12 miles north of Arroyo Grande in 34-32s-15e. Exposures of oil sand and seepages occur throughout the area and a number of the wildcats drilled in the past have had fair showings of both oil and gas.

Union Oil Company is drilling Mary C. Phelan 1 below 1900 feet on 32-12n-34w in the southern part of the county. Union has several thousand acres under lease in the area and has drilled 2 unsuccessful tests about 4 miles to the south.

Northwest of San Miguel, a group of companies, including E. B. Hall and Company, Oceanic Oil Company, Bankline Company, Occidental Petroleum Company, and Barnsdall Oil Company have leased 11,000 acres extending into southern Monterey County on which 1 unsuccessful test has been drilled this year. The group has not revealed its plans for further prospecting.

Kern County: General Petroleum Corporation has staked a wildcat, Cotton wood 68, in 24-29s-29e, about 3 miles northeast of production in the Race Track Hill field.

About 1 mile southwest of production in the Midway field in 14-32s-22e the Western Mesa Oil Corporation was preparing to drill an outpost test.

Indications are that production does not extend very far northwest of Pacific Western Oil Corporation's recent oil discovery in the McKittrick area. The

company's Midway-McKittrick A-73-30 in 30-30s-22e, about 800 feet northwest of the discovery, is understood to have been gray and barren in the lower part of the hole. With bottom at 5075 feet, operator set a plug at 4363 feet and will set 7-inch casing on top of the plug. Pacific Western is also drilling Rankin 85-30 about 600 feet south of the discovery, but the outcome of this well may not be known for several weeks.

Continental Oil Company has abandoned 1 of 3 wildcats it is drilling in the San Emidio area. Drill pipe fish in the bottom of K.C.L. 1 in 11-11n-22w could not be recovered and the hole was given up at redrilled depth of 10,359 feet. Old depth was 10,424 feet. K.C.L. L-2 in 8-11n-21w is drilling below 7750 feet and K.C.L. M-1 in 27-11n-22w has reached a depth of approximately 8500 feet. Southwest of the latter location in 5-10n-22w Apex Petroleum Corporation has spudded K.C.L. 1. The area, which is southeast of the Midway-Sunset field, is well regarded, but none of the many test wells drilled to date have been successful.

Kings County: Standard Oil Company of California has recovered and pulled stuck drill pipe in its 30V discovery well on the Middle Dome of Kettleman Hills. Standard brought in this well last February as an Eocene discovery, initial production being about 500 barrels a day through ½-inch choke. The well was completed despite the presence of drill pipe fish in the bottom of the hole. After a few days, salt water broke in and the well was killed. The intervening time has been taken up with a redrill job which culminated in the recovery of the fish. The operator now has about 1957 feet to go before redrilled hole is down to 12,389 feet, depth of the original hole.

Los Angeles County: Aurora Corporation, which recently took over Shell Oil Company's Braille Institute lease in Waltz Canyon near Newhall, has spudded Braille Institute 2. The No. 1 well, brought in by Shell last year, was a small pumper considered subcommercial by Shell, which turned over the lease to Aurora.

• Canada

Globe Leduc West Reaches Top Of D2 Zone at 5024 Feet

Globe Leduc West 1, wildcat 2½ miles west of the Leduc proven area has thinned in Upper Devonian and reached top D2 zone at about 5024 feet, 3 feet higher in elevation than the deepest Leduc well, Imperial 2, and 115 feet higher than the D2 zone water line established at Imperial 7.

The Globe well gained 135 feet in Devonian and was 131 feet lower than Imperial 2 at Devonian contact. It will core five feet into the zone and drill-stem test. The well appears to be a fair prospect for expansion of the Leduc proven area.

Imperial has set casing at 2 more Leduc successes, making the score 10 producers in a row since the February discovery. Imperial 12 completed in D2, while Imperial 13 completed in D3 as a ¼-mile extension. Drill-stem tests indicate potentials comparable to previous completions.

Rates: Regular classified (undisplayed) set in this size type: 7 cents per word for first insertion and 5 cents per word for each succeeding insertion for same copy. Displayed advertisements, set in suitably larger type with ruled border, $5 per inch for first insertion and $4 per inch for succeeding insertions same copy. **All classified ads payable in advance.** Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.

FOR SALE

■ For Sale: Humble bottom hole recording pressure gauges 3000 and 4500 lbs., and Halliburton reel and measure meter. Address: Box 103W, c/o World Oil, Houston, Texas.

■ WELL drilling equipment. Spudders, beams, core drills, light rotaries. Used equipment fully reconditioned. Also tools, cable, casing. Almost everything for well drilling. Pressey & Son, Pueblo, Colo.

■ Light plants, war surplus, 110-AC, all sizes, for home or commercial use, ⅓ of original cost. Auffenberg, 820 No. Kingshighway, St. Louis, Mo.

■ For Sale—All or one-half royalty on 553½ acres. Jas. Buchanan Lease, Burleson County, Texas. C. H. Barnett, Caldwell, Texas.

■ FOR SALE—Mississippi River barge terminal site at Vicksburg. Eight acres, 555 feet river front, 330 feet frontage on two transcontinental highways, easement for pipe line to railroad. J. B. Dabney, Vicksburg, Miss.

One No. 7080-145 GKU Waukesha Engine IDECO Super Duty Service Unit complete with cathead. Unit practically new. Has skids with extra gasoline tank and can be used with gas, gasoline or butane. Call: The Cavins Corp., C-0439, Houston, Texas.

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ADVERTISER INTERESTED IN PURCHASING 3 TO 4,000 BARREL REFINERY FOR DISMANTLING. PRINCIPALS PLEASE WRITE WITH FULL DETAILS AND PRICE. ADDRESS: BOX 108W, c/o WORLD, OIL, HOUSTON, TEXAS.

NOTICES, SERVICES

DEER HUNTING LEASE

19,278 acre Leon Ranch, 6 miles south Oakwood, Leon County, 140 miles northwest Houston, 120 miles southeast Dallas, available for exclusive hunting and fishing lease. Estimate 600-800 deer on place. Operated as cattle and hog ranch. Ample ranch roads and trails; oak and pine timber providing excellent cover. 68 acre lake is stocked with bass, trout and perch. Exclusive use of Lodge and Guest House with all modern conveniences, ample accommodations for 10 or 12 men included. 20 to 25 hunters is recommended maximum. Offered complete, subject prior negotiations, on exclusive lease for 1947 season, $2,500. Telephone or wire Lester Foran, 603 Nixon Building, Telephone 4367, Corpus Christi, Texas.

Read the Trading Post For Sales and Service

LEASES, DRILLING, ACREAGE, ETC.

■ SEE A. L. BOWLES, ADA, OKLAHOMA, FOR SHALLOW DRILLING DEALS IN OKLAHOMA.

■ I have lease on N 80 of N 160 acres T.E.&L. Co. Survey 1862, Abst. 543, Archer County, Texas. Shallow wildcat territory. Good geology. Will sell for small cash consideration and overriding royalty. Address: 2016 Lucile St., Wichita Falls, Texas.

OIL POSSIBILITIES IN CUBA

100,000 hectareas or 250,000 acres with great oil possibilities on the north coast of Oriente Province, Cuba, (Puerto Padre), are ready for sale or lease at very reasonable terms. At present, in the center of said property two wells have been drilled; one to 1625 feet and showings of oil came true at 1515 feet when 40 barrels of heavy crude with 13.5 A.P.I. gravity were recovered and plenty of gas. The other well is today at 1000 feet with very good showings of gas and thousands of oil drops. The rock, according to Mr. Glen Ruby, (prominent geologist), who just visited those properties is a conglomerate of igneous tuffs and redeposited Serpentine, which can store oil. Any information desired, can address to Mr. Alberto Quadreny, Engineer, Obispo St. No. 411, Habana, Cuba.

BUSINESS OPPORTUNITIES

REFINERY, Small—Refinery Executive wants to build small refinery as partner with producer who has or can obtain 1,500 to 2,500 barrels of crude per day. Excellent opportunity to obtain more money for your crude. Address: Box 10W, c/o World Oil, Houston, Texas.

HELP WANTED

■ FOREIGN POSITIONS: Junior Engineers, Material Men, Material Accountant, Payroll Clerks, Field Auditors, Warehouse Clerks, Geologists, Draftsmen, Male Stenographer-Clerks, Diesel Mechanics. These positions and many more are now opened for experienced applicants. Prefer single men. Fee paid by employer. Mail your resume to: CHAS. J. LOVELESS PERSONNEL SERVICE, 508 MAYO BUILDING, TULSA, OKLAHOMA.

An oil field service organization has opening in West Texas-New Mexico area for petroleum engineer in technical oil field service. Applicant must have some experience in oil production and degree in petroleum engineering. Permanent position with long established company. Write giving full details on education, experience, age, and marital status. Attach small photograph. Address replies to Box 109W, c/o World Oil, Houston, Texas.

"POWER RIG MECHANIC for work in South Louisiana and Mississippi. Must have had previous Oilfield experience with Gas-Butane Rigs. Must be sober and reliable. Good proposition for right man. Write P. O. Box 1268, Baton Rouge, Louisiana, for particulars and interview."

EXPLORATORY FAILURES

ALABAMA WILDCAT

Fayette County: Amerada's D. H. Wright 1, nw sw 8-15s-10w, Bangor 2030, Tuscumbia 2760, Silurian 3020, abnd 9-11-47 at 4571.

ARKANSAS WILDCAT

Jefferson County: F. R. Jackson's Ford 1, c se nw se 6-4s-9w, Igneous 3143, abnd 9-5-47 at 3153.

CALIFORNIA WILDCATS

Kern County: Caliente Oil Co.'s Cohn Estate 1, 12-30s-29e, Edison area, abnd 9-10-47 at 6301.

Continental's K. C. L. L-1, 11-11n-22w, San Emigdio area, abnd 9-11-47 at 10,424.

L. M. Lockhart's Kern Property Corp. 1, 20-26s-22e, Lost Hills area, abnd 9-9-47 at 4097.

J. H. Maurer-Arthur C. Fisher's Linda 2, 11-29s-29e, Round Mt. area, abnd 9-8-47 at 833.

Western Gulf Oil Co., Di Giorgio 2, 10-31s-29e, Arvin area, abnd 9-11-47 at 6468.

Santa Barbara County: Barnsdall's Magenheimer 4, 8-8n-32w, Gato Ridge area, abnd 9-11-47 at 4307.

Ohio Oil's Thomas B. Bishop Co. 2, 6-4n-28w, Goleta area, abnd 9-12-47 at 2060.

Union Oil's Giorgi 1, 12-8n-32w, Gato Ridge area, abnd 9-7-47 at 4497.

Yolo County: Texas Co.'s Dunnigan Unit Two 1, 1-10n-1w, Dunnigan Hills area, abnd 9-8-47 at 4000.

COLORADO WILDCAT

Moffat County: Carter's Unit 1, c se se 30-8n-90w, North Craig, Ft. Union 2020, Lance 2965, Lewis 3126, Mesaverde 5286, Mancos 8230, abnd 9-11-47 at 9000.

COLORADO OUTPOST

Rio Blanco County—Piceance Creek: General Pet.'s 24-12-G, se sw nw 12-2s-96w, Wasatch 3681, show oil and gas, abnd 9-6-47 at 3698.

KANSAS WILDCATS

Cowley County: Big Five Oil Co.'s Bolock 1, ne nw ne 21-32s-6e, abnd 3001.

Graham County: Anderson-Prichard et al's Griffith 1, se sw se 15-10s-22w, abnd 3921.

Lincoln County: H. H. & B. Drlg. Co.'s Ordway 1, ne nw nw 21-10s-18w, abnd 3725.

McPherson County: Lowell Drlg. Co.'s Greenwood 1, sw sw ne 28-18s-1w, abnd 3365.

Nemaha County: Dalton Woods' Marshall 2, nwc 29-4s-9e, abnd 1365.

Pratt County: Lion's Curry 1, nwc 25-29s-12w, abnd 4775.

Rooks County: Tom Palmer's Wickham 1, ne ne sw 4-10s-17w, abnd 3548.

Rush County: Crown Oil Co.'s Josefiak 1, se se ne 26-19s-19w, abnd 4232.

Sheridan County: Cities Service's Hansen 1-E, c n½ sw ne 28-8s-26w, abnd 3950.

MICHIGAN WILDCATS

Isabella County: Wicklund Dev. Co.'s Marshall 1, ne ne sw 24-14n-6w, Dundee 3632, abnd 9-8-47 at 3761.

Newaygo County: Scott Drlg. Co.'s Shoe 1, sw se se 35-13n-13w, Traverse 2415, abnd 9-9-47 at 2958.

Oscoda County: J. O. Mutch's Oakes 1, nw sw nw 30-26n-3e, Dundee 3196, abnd 9-9-47 at 3275.

Wexford County: J. O. Mutch's McCane 1, c sw 21-24n-9w, abnd 9-5-47 at 2540.

MISSISSIPPI WILDCAT

Sharkey County: Continental's USDA 1, 30-11n-5w, abnd 9-4-47 at 4450.

MONTANA WILDCAT

Sweetgrass County: Cremer et al's Cremer 1, se sw se 4-4n-16e, abnd 401.

NEW MEXICO WILDCATS

Chaves County: Grayburg Oil Co.'s Keeley 13-B, 1345 fr nl 1295 fr el 26-17s-29e, abnd 8-28-47 at 5076.

Rio Arriba County: Florence Drlg.'s Tribal 1, ne ne sw 23-32n-3w, Juanita area, abnd 3710.

OKLAHOMA WILDCATS

Comanche County: I. H. White's Doyle 1, se se se 7-4n-11w, abnd 650.

Cotton County: Kellerher McMann's Kahin-a-watch-it 2, nw nw ne 12-3s-12w, abnd 1809.

E. C. Harlen's Gower 1, nw nw ne 29-4s-9w, abnd 2110.

Garfield County: Dave Morgan's Kingery 1, nw nw se 13-23n-3w, abnd 4650.

Hughes County: Kingery & Patterson's Gilmore 1, ne se se 7-5n-9e, abnd 2693.

Beebe & Berry Drlg. Co. et al's Clark 1, (OWDD) sw sw ne 21-8n-9e, otd 3589, abnd 4572.

Jefferson County: Heydrick Oil Co.'s Majors 1, nw nw nw 10-6s-8w, abnd 3445.

Reno Oil Co.'s Scheer 1, ne ne ne 26-7s-6w, abnd 2030.

Noble County: Deep Rock Oil Corp's McCormick 1, sw se sw 1-23n-1w, abnd 5063.

Jarree-Monatt & Hale's Siler 1, se se nw 24-24n-1w, abnd 4510.

Pawnee County: H. H. Taylor's Garrett 1, nw sw se 20-22n-6e, abnd 3448.

Tillman County: W. G. Gouchie's Algood 1, ne se se 18-1n-18w, abnd 1138.

WEST TEXAS WILDCATS

Andrews County: McAlester Fuel Co.'s M. M. Fisher Est. 1, 660 fr s&wl sect 4, Blk A-36, PSL Sur, 1 mi n Shafter Lake area, Yates 2860, Glorietta 5740, Clear Fork 6167, Tubb 6695, abnd 9-1-47 at 7365.

Dawson County: R. G. Clay's O. W. Jones 1, 660 fr nl 1980 fr el sect 26, Blk 35, T-5-N, T&P Sur, 4½ mi se Lamesa, San Andres 4360, abnd 8-27-47 at 4360.

Yoakum County: Texas Co.'s Roy Fitzgerald 1, 1980 fr s&el sect 440, Blk D, J. H. Gibson Sur, abnd 8-28-47 at 5524.

NORTH TEXAS WILDCATS

Archer County: M. W. Blair's J. J. Perkins 1, 1350 fr nl 150 fr wl of lse, W. E. Probst Sur, Bunsite li 1452, abnd 9-3-47 at 1564.

J. G. Fowler's Cora M. Hull 1, 1480 s 450 e of sel Blk 134, J. W. Harris, but in Jose Ostane Sur, abnd 9-6-47 at 2231.

Young County: R. R. Carey et al's W. S. Davis et al 1, 450 fr sl 150 fr wl e½ sect 66 TE&L Co. Sur, Gunsite li 1036, abnd 8-28-47 1134.

H. W. Snowden O&G Co.'s Burch Est 2, 1263 fr nl 1537 fr wl sect 466 TE&L Co. Sur, abnd at 3849.

NORTH CENTRAL TEXAS WILDCATS

Brown County: W. W. Connell's O. L. Pierce 1, 690 fr nec 330 fr el Pierce 143.5-ac lse Osborne Dalton Sur 26, Ranger li 2180, Ellenburger 2466, abnd 8-31-47 at 2621.

Fisher County: Newmont Oil Co.'s A. W. Lines 1, 2500 fr nl 1250 fr el Wm. David Sur 286, 2 mi sw Eskota field, Valera 1740, Dothan 2728, Noodle Creek 2800, Saddle Creek 2945, Flippen 3008, abnd 8-23-47 at 4656.

Haskell County: Cabot Carbon Co.'s Carrigan et al 1, 2310 fr sl 8990 fr wl S. C. Robertson Sur 40, Palo Pinto li 3195, abnd 8-31-47 at 3255.

Stephens County: Algord Oil Co.'s G. H. Iles 1, 3330 fr el 1188 fr sl sect 6 AB&M Sur, abnd 8-31-47 at 4022.

Fred M. Manning's A. D. Mueller 1, 467 fr n&el sect 25, A. Marshall Sur, Caddo li 3367, abnd 8-30-47 at 3650.

Throckmorton County: Owenwood Pool's Housley & McCord 3,660 fr s&wl e½ sect 28, Comanche Ind. Res. Sur, Mississippi 4704, abnd 9-5-47 at 4794.

NORTHEAST TEXAS WILDCAT

Anderson County: Standard's Southern Pine Lbr. Co. 1, 1699 s of nl 1191 e of wl 389.7-ac tr Jesse Gibson Sur, Pecan 4233-4623, Austin 5175, Woodbine 5477, abnd 9-12-47 at 6046.

SOUTHWEST TEXAS-LOWER COAST WILDCAT

Jim Hogg County: V. L. Blanchard's Downs Royalty Corp. 1, 330 fr se&swl lot 29, O. N. Beer & Millard J. Coffee sbdn, El Javali Gr, abnd 9-3-47 at 2540.

MIDDLE TEXAS COAST WILDCATS

Bee County: PLD Well Service Co.'s I. F. Welder 1, 467 fr se&swl 80-ac lse and blk 6, J. M. Planes sur, abnd 9-12-47 at 4425.

Goliad County: Ginther, Warren & Ginther's Carrie G. Wood et al 6, 50 s of nl Solon Bartlett sur, 4700 ne of swl 5046.4-ac lse, abnd 9-12-47 at 5499.

Live Oak County: Continental's Frank Lukasik 1, 4600 fr swl 6000 fr nwl Cameron CSL Sur, 1 2/3 mi s se exten well at Kittie West fld, Pettus 3130, Queen City 5750, Slick 7170, Luling 7375, abnd 9-8-47 at 8424.

Oil Drlg.'s Holman Cartwright 1, 3700 fr sel 100 fr nel J. Poitevent Sur 1, abnd 9-9-47 at 6750.

UPPER TEXAS COAST WILDCATS

Austin County: Humble's C. S. Hillbolt 1, start sely/cor 738-ac lse go 2500 nw alg nel lse th 2000 sw at ra to lcn, H. E. F. Frisins Sur, abnd 9-8-47 at 10,007.

Montgomery County: Union Prod. Co.'s Foster Lbr. Co. 1, 7560 fr wl 1025 fr nl 1800-ac tr, Pryor Bryan Sur, abnd 9-6-47 at 11,119.

San Jacinto County: Atlantic's R. L. White 1, 660 fr n&wl 37.6-ac tr, Mary Rucker sur, abnd 9-7-47 at 10,506.

Magnolia's W. S. Dixon & Falvey 2, 6780 fr el 1320 fr sl Cole Lge, abnd 9-9-47 at 11,517.

UPPER TEXAS COAST OUTPOST

Matagorda County: Skelly's Helen E. Hurlock 1, 330 fr sel 1875 fr swl 200-ac lse, Freeman Pettus Sur, 3800 e ne Stanolind's Hurlock 3-B, 3350 ne Union of Calif.'s Hurlock 2, abnd 9-2-47 at 10,507.

WYOMING NEW PAY TEST

Fremont County—Hudson: Stanolind's Terry 3-M, nw sw sw 19-2s-2e (WRM) Madison test, Tensleep 1697, abnd 9-8-47, at 1886, pb 1767.

DAN L. CLARK W. M. AVERILL RUPERT COX

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SQUEAKS *from the* BULL WHEEL

Slips That Pass

The following classified ads appeared in a small town newspaper: March 1—For sale: Slightly used farm wench in good condition. Phone 0000. A. Smith.

March 2—CORRECTION: Due to an unfortunate error Mr. A. Smith's ad in last night's paper was not clear. He has an excellent winch for sale. We trust this will put an end to jokesters who have called Mr. Smith and greatly bothered his housekeeper, Mrs. Jones, who loves with him.

March 3—NOTICE: My W-I-N-C-H is not for sale. I put a sledgehammer to it. Don't bother calling 0000. I had the phone taken out. I am NOT carrying on with Mrs. Jones. She merely L-I-V-E-S here. A. Smith.

Half Exciting

"I don't care for Joe. Half the time he wants to mug and the other half he wants to talk about literature."

"I don't blame you. I don't like books, either."

Too Much Feeling

The elevator was tightly jammed when a girl said fiercely: "Take your hands off me, you louse! No, not you! YOU!"

Aches That Rattle

A friend once wrote Mark Twain a letter stating that he was very sick, and concluded: "Is there anything worse than having toothache and earache at the same time?"

The humorist wrote back: "Yes, rheumatism and Saint Vitus dance."

Time Staggers On

The five stages of "Brandy and Water":

One: "Brandy and Water."
Two: "Branny and Warwer."
Three: "Bran Warr."
Four: "Brraorr."
Five: "Collapse."

Poet's Nook

A certain young fellow named Beebee
Wished to marry a lady named Phoebe
"But," he said, "I must see
What the clerical fee
Will be before Phoebe be Beebee"

Encore

A dashing young fellow named Joe
Has lost all his happy glow.
He used to be sunny,
He had lots of money—
But that was two blondes ago.

The Better Way

"I've got a pretty distasteful job before me," remarked the genealogist.

"Mrs. Newrich employed me to look up her family-tree, and I've got to inform her that one of her relatives was electrocuted."

"Why worry about that," said his friend. "Just write that the man in question 'occupied the chair of applied electricity at one of our public institutions.'"

Life Is Like This

"Thanks very much for the present."

"Oh, that's nothing to thank me for!"

"That's what I thought, but mother told me to thank you just the same."

The Woman's Way

"So you met your wife at a dance, did you? Gosh, that must have been romantic."

"Naw, embarrassing. I thought she was home taking care of the kids."

Or Use a Bottle

"Say, what are those marks on your nose?"

"They were made by glasses."

"You should learn to tilt your head back—it pours easier."

Good Idea

"My idea of a good wife is a woman who can make good bread."

"My idea of a good husband is a man who can raise the dough in the hour of knead."

Dry Music

"Say, Captain, why does your orderly always whistle when he mixes cocktails?"

"My orders! It's the only way I can be sure he isn't drinking."

Feet Hurt, Maybe

"Who was that lady I saw you with last night?"

"That was my brother. He just walks that way."

Much in the Swim

Overhead on the ocean-bound bus:

"Have you seen the beach before?"

"Si, si, Senor. I am engaged to her."

Doggy Environment

"I'm going to enter Fido in the dog show next month."

"Do you think he will win a prize?"

"No, but he'll meet some very nice dogs."

FILTRATION
Systems and Service

Efficient, economical filtration systems for salt water disposal or feed water purification. Standard filtration methods are intelligently applied to assure proper coagulation and crystal clear effluent.

Fast Deliveries . . . . Dependable Service

GULF ENGINEERING CO., INC.
"Service, Not Promises"
1682 INGEBORG ST. HOUSTON, TEXAS
916 S. PETERS STREET NEW ORLEANS, LA.

WIPE SUCKER RODS CLEAN

Here's a compact Sucker Rod Wiper designed as Well Pullers wanted it. Short overall height, 4", just right height for wrenching rods. Weight complete, only 36#. Easy to handle, comes mounted on pony rod ready to be used, if so ordered. Tough, natural rubber wiping webs squeegee rod, box and square free of oil. No oil leaves hole or flips on crew... Rubbers stand enough pressure to take oil to tank or sump if well flows. Wipes any size rod, ⅝" to 1¼".

The Wiper Housing contains two rubber wiping elements. It is furnished complete to make up on all standard pumping tees. The Plain Cap type is shown above and the Table Plate Head model, below:

The cut away drawing shows sturdy construction of both types. The handy Table Plate Head holds rod tools and elevators.

Write for Catalog 310, code names and complete specifications or see your Patterson-Ballagh man.

Specify
PATTERSON-BALLAGH
DIVISION OF BYRON JACKSON CO.
"Best Bet Yet"

SUCKER ROD WIPERS
1900 E. 65th Street, Los Angeles 1
6247 Navigation Blvd., Houston 11
808 Graybar Bldg., New York 17
931 Russ Building, San Francisco 4

Columbia Steel Company Plans New Unit In Los Angeles Area

J. Lester Perry, president of Columbia Steel Company, United States Steel subsidiary, has announced that a cold reduction mill with a capacity to produce over 300,000 tons of sheets a year will be built by that company in the Los Angeles area.

It is hoped that construction of the new mill will be completed by the end of 1949, provided no unforeseen delays occur.

In addition to cold reduced sheets, the new mill will also be equipped for hot rolled sheet processing and for sheet galvanizing and coating, in order to meet the West Coast demand for these types of products.

In August, 1945, U. S. Steel announced that studies were being made with a view to modernizing Columbia's steel facilities in the Los Angeles area. A modern cold reduced sheet mill was a part of that contemplated program.

It is expected that the new mill will employ about 1500 men and will cover 150 to 200 acres.

Core Lab Engineering and Research Departments To Be Reorganized

Core Laboratories, Inc., has announced the disassociation of its engineering and research departments and their reorganization into a new firm to be headed by James A. Lewis, recently resigned president of Core Lab.

Lewis' firm will engage in reservoir engineering, consultation, and allied operations, and will continue to do engineering and research work for Core Lab, as well as for the industry. The new firm, to be known as James A. Lewis, Engineering, will headquarter in Dallas, Core Lab's operations in the Illinois, Indiana, and Kentucky territory will be operated by the new organization under a license arrangement.

Core Laboratories, Inc., under the general managership of W. H. Davison, vice president, will continue to operate as a service organization for core analysis through the use of portable field laboratories and frozen cores; reservoir fluid analysis; well sampling; a new service of drill cuttings analysis; and several new procedures and techniques to be announced at an early date.

Look AT THE SAVINGS YOU MAKE with

HUBER PARAFFIN SCRAPERS

	WELL No. 1		WELL No. 2	
	Year Before Install.	Year After Install.	Year Before Install.	Year After Install.
Paraffin Expense	$1347.00	-0-	$ 767	-0-
Bbls. Oil Prod.	9859	9046	9978	8502
Paraffin Cost per Bbl.	$ .137	-0-	$ .077	-0-
Expense Reduction	$1347		$ 767	
First Yr's Operation Installation Cost	401		401	
NET SAVING	$ 946		$ 366	

Here are the savings made by a major company in one year with Huber Scrapers in two of their pumping wells. Well No. 1 saved more than twice the cost of the Scrapers . . . Well No. 2 saved about 90% of their cost. By preventing paraffin accumulation with Huber Scrapers, this company completely eliminated all paraffin removal expense.

It will pay you to install Huber Scrapers in your pumping wells where paraffin is accumulating. Have them installed now, and put an end to costly paraffin trouble.

ORDER FROM YOUR SUPPLY STORE

HUBER PARAFFIN SCRAPERS

J. M. HUBER CORPORATION

BOX 831 BORGER, TEXAS

Advertisers' Index

* The asterisk indicates that detailed information on products and services of the firm will be found in current 15th (1946-47) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

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